ALBERT R. MANN LIBRARY
AT
CORNELL UNIVERSITY

CORNELL UNIVERSITY LIBRARY
3 1924 081 052 072

All books are subject to recall after two weeks

DATE DUE

~~OCT - 6 2000~~

GAYLORD

PRINTED IN U.S.A.

QK
600
M992
v.68
1998

QK
600
M992
v.68
1998

MYCOTAXON

AN INTERNATIONAL JOURNAL FOR RESEARCH ON
TAXONOMY & NOMENCLATURE OF FUNGI, INCLUDING LICHENS

Volume LXVIII July-September 1998

CONTENTS

Revised instructions to authors 1
Guidelines for reviewers of papers submitted for publication in Mycotaxon 9
Notes on conidial fungi. XVII. *Amphophialis,* anam. gen. nov. **R. F. Castañeda Ruiz, B. Kendrick, and J. Guarro** 11
Two new asterinaceous fungi from Karala, India **V. B. Hosagoudar, T. K. Abraham, and J. L. Crane** 19
Notes on conidial fungi. XVIII. New species of *Pseudomicrodochium* and *Refractohilum* from rainforest litter **R. F. Castañeda Ruiz, B. Kendrick, and J. Guarro** 23
Hyphomycetes from Canadian streams. IV. *Spirosphaera dimorpha* sp. nov. **Ludmila Marvanová and Felix Bärlocher** 33
Meliola chennaiana sp. nov. and some additional records of fungi from India **R. D. Goos and V. B. Hosagoudar** 41
Diplomitoporus dilutabilis a new species of Polyporaceae (Aphyllophorales) from Santa Catarina Island, Brazil **Clarice Loguercio-Leite and Jorge E. Wright** 47
Ultrastructure des asques et des ascospores de *Desmazierella acicola* (Sarcoscyphaceae, Pezizales, Ascomycetes). Intérêt sytématique et biologique **Leda M. Meléndez-Howell, Alain Couté, Gérard Mascarell, and André Bellemère** 53
Annotated check list of New Caledonian Basidiomycota. I. Holobasidiomycetes **E. Horak and J. Mouchacca** 75
Periconia fusiformis anam. sp. nov. **M. Muntañola-Cvetković, P. Hoyo, and A. Gómez-Bolea** 131
Tropical Hyphomycetes of Mexico. III. Some species from the Calakmul Biosphere Reserve, Campeche **Gabriela Heredia Abarca and Ángel Mercado Sierra** 137
Arborillus llimonae nov. gen. et sp., a synnematous lichenicolous hyphomycete **M. Muntañola-Cvetković and A. Gómez-Bolea** 145
Schizopora trametoides sp. nov. A trimitic dimidiate species from Sumatra **Suhirman and María Núñez** 157
Entrophospora baltica sp. nov. and *Glomus fuegianum,* two species in the Glomales from Poland **Janusz Błaszkowski, Tadeusz Madej, and Mariusz Tadych** 165
New records from India and redescription of *Corynascus thermophilus* and its anamorph *Myceliophthora fergusii* **Lynne Sigler, K. R. Aneja, R. Kumar, R. Maheshwari, and R. V. Shukla** 185
Notes on four little red Russulas **Raymond M. Fatto** 193
Annotated list of the pleosporacean fungi and related genera reported from the Iberian Peninsula and Balearic Islands **J. Checa** 205
Conidium development in *Hyalodendron* and *Allescheriella* anamorphs of *Ophiostoma* and *Ceratocystiopsis* **E. Benade, M. J. Wingfield, and P. S. Van Wyk** 251

[Contents continued inside front cover]

ISSN 0093-4666 MYXNAE 68: 1-536 (1998)

For subscription details, availability in microform, and availability of articles as photocopies or tear sheets, see back cover.

[Contents continued from front cover]

Ruhlandiella berolinensis, an exotic species in Europe **R. Galán and G. Moreno** 265
Indonesian Aphyllophorales 3. Poroid and stereoid species from Kerinci-Seblat National Park, western Sumatra **Suhirman and María Núñez** 273
Oidium sp. (Erysiphaceae) on *Cassia senna,* a fungus new to the mycota of Europe **Tadeusz Madej and Janusz Błaszkowski** 293
Cercosporoid fungi from Brazil. 2 **Pedro W. Crous and Marcos P. S. Câmara** 299
On *Helminthosporium anomalum* **R. A. Shoemaker** 311
Filosporella exilis sp. nov. on submerged plant debris from Belarus **Vladislav I. Gulis and Ludmila Marvanová** 313
A new variety of *Baggea pachyascus* (Patellariaceae, Ascomycota) from Finland **M. Magnes, Ch. Scheuer, and U. Söderholm** 321
New Australasian Ustilaginales **Kálmán Vánky** 327
The genus *Kretzschmaria* **Jack D. Rogers and Yu-Ming Ju** 345
Pyrenomycetes of British Columbia collected by John Macoun **Margaret E. Barr** 395
Rhytisma americanum sp. nov.: a previously undescribed species of *Rhytisma* on maples (*Acer* spp.) **George W. Hudler, Sandra Jensen-Tracy, and Mark T. Banik** 405
Alternaria themes and variations (224–225) **Emory G. Simmons** 417
The lichen family Parmeliaceae (Ascomycotina) on Lord Howe Island, Australia **Simone H. J. J. Louwhoff and John A. Elix** 429
The chemistry of some species of *Buellia* sensu lato (Lecanorales, lichenized Ascomycotina) **Klaus Kalb and John A. Elix** 465
A new species of *Echinodontium* from Italy **Annarosa Bernicchia and Andrea Piga** 483
Powdery mildew on *Conyza* and *Cosmos* in Turkey **A. Karakaya** 493
Comments on the names Trametaceae, Coriolaceae, and Trametales **Jacques Boidin and Richard P. Korf** 497
Tulostoma portoricense (Tulostomatales, Gasteromycetes) from Mexico **M. Esqueda-Valle, E. Pérez-Silva, T. Herrera, A. Altés, and G. Moreno** 499
Phenetic analysis of genera of the Saprolegniaceae (Oomycetes) **Martha J. Powell and Will H. Blackwell** 505
Book Reviews..**Eric H. C. McKenzie** 517
Author Index.. 521
Index to Fungous and Lichen Taxa.. 525
Reviewers... 535
Errata.. 535
Publication Date for Volume 67.. 536
Journal Publication Statement... 536

© Mycotaxon, Ltd., 1998

MYCOTAXON

AN INTERNATIONAL JOURNAL OF RESEARCH ON
TAXONOMY & NOMENCLATURE OF FUNGI, INCLUDING LICHENS

VOLUME LXVIII, 1998

COMPLETE IN ONE VOLUME
CONSISTING OF iv + 536 PAGES INCLUDING FIGURES

QK
600
M992
v. 68
1998

EDITOR-IN-CHIEF

Pavel Lizoň
Plant Pathology Herbarium, Cornell University
401 Plant Pathology Bldg.
Ithaca, NY 14853-4203, USA

ASSOCIATE EDITORS

Eric H. C. McKenzie
BOOK REVIEW EDITOR
Herbarium PDD
Manaaki Whenua - Landcare Research
Private Bag 92170, Auckland, New Zealand

Grégoire L. Hennebert
FRENCH LANGUAGE EDITOR
32 Rue de l'Élevage
B-1340 Ottignies - LLN, Belgium

Karen D. Gettelman
INDEX EDITOR
7044 Amherst Avenue
St. Louis, MO 63130, USA

EDITORIAL ADVISORY BOARD

OVE ERIKSSON, Umeå, Sweden (1990-99, *Chm.)*
JACK D. ROGERS, Pullman, Washington, USA (1990-98, *Past Chm.*)
GARY J. SAMUELS, Beltsville, Maryland, USA (1997-2000)
DONALD H. PFISTER, Cambridge, Massachusetts, USA (1997-2001)
GREGORY H. MUELLER, Chicago, Illinois, USA (1998-2002)
CAROL H. SHEARER, Urbana, Illinois, USA (1999-2003)

Published by
MYCOTAXON, LTD., P.O.BOX 264
ITHACA, NY 14851-0264, USA

www.mycotaxon.com

Accredited with the International Association for Plant Taxonomy
for the purpose of registration of new names of fungi

Printed in the United States of America

© Mycotaxon, Ltd., 1998

TABLE OF CONTENTS, VOLUME SIXTY-EIGHT

July-September 1998

Revised instructions to authors 1
Guidelines for reviewers of papers submitted for publication in Mycotaxon 9
Notes on conidial fungi. XVII. *Amphophialis*, anam. gen. nov.
R. F. Castañeda Ruíz, B. Kendrick, and J. Guarro 11
Two new asterinaceous fungi from Karala, India
V. B. Hosagoudar, T. K. Abraham, and J. L. Crane 19
Notes on conidial fungi. XVIII. New species of *Pseudomicrodochium* and *Refractohilum* from rainforest litter
R. F. Castañeda Ruíz, B. Kendrick, and J. Guarro 23
Hyphomycetes from Canadian streams. IV. *Spirosphaera dimorpha* sp. nov.
Ludmila Marvanová and Felix Bärlocher 33
Meliola chennaiana sp. nov. and some additional records of fungi from India
R. D. Goos and V. B. Hosagoudar 41
Diplomitoporus dilutabilis, a new species of Polyporaceae (Aphyllophorales) from Santa Catarina Island, Brazil
Clarice Loguercio-Leite and Jorge E. Wright 47
Ultrastructure des asques et des ascospores de *Desmazierella acicola* (Sarcoscyphaceae, Pezizales, Ascomycetes). Intérêt sytématique et biologique
Leda M. Meléndez-Howell, Alain Couté, Gérard Mascarell, and André Bellemère 53
Annotated check list of New Caledonian Basidiomycota. I. Holobasidiomycetes
E. Horak and J. Mouchacca 75
Periconia fusiformis anam. sp. nov.
M. Muntañola-Cvetković, P. Hoyo, and A. Gómez-Bolea 131
Tropical Hyphomycetes of Mexico. III. Some species from the Calakmul Biosphere Reserve, Campeche
Gabriela Heredia Abarca and Ángel Mercado Sierra 137
Arborillus llimonae nov. gen. et sp., a synnematous lichenicolous hyphomycete
M. Muntañola-Cvetković, and A. Gómez-Bolea 145
Schizopora trametoides sp. nov. A trimitic dimidiate species from Sumatra
Suhirman and María Núñez 157
Entrophospora baltica sp. nov. and *Glomus fuegianum*, two species in the Glomales from Poland
Janusz Błaszkowski, Tadeusz Madej, and Mariusz Tadych 165
New records from India and redescription of *Corynascus thermophilus* and its anamorph, *Myceliophthora fergusii*
Lynne Sigler, K. R. Aneja, R. Kumar, R. Maheshwari, and R. V. Shukla 185
Notes on four little red Russulas **Raymond M. Fatto** 193
Annotated list of the pleosporacean fungi and related genera reported from the Iberian Peninsula and Balearic Islands **J. Checa** 205
Conidium development in *Hyalodendron* and *Allescheriella* anamorphs of *Ophiostoma* and *Ceratocystiopsis*
E. Benade, M. J. Wingfield, and P. S. Van Wyk 251
Ruhlandiella berolinensis, an exotic species in Europe
R. Galán and G. Moreno 265

Indonesian Aphyllophorales 3. Poroid and stereoid species from Kerinci-Seblat National Park, western Sumatra **Suhirman and María Núñez** 273

Oidium sp. (Erysiphaceae) on *Cassia senna,* a fungus new to the mycota of Europe **Tadeusz Madej and Janusz Błaszkowski** 293

Cercosporoid fungi from Brazil. 2 **Pedro W. Crous and Marcos P. S. Câmara** 299

On *Helminthosporium anomalum* **R. A. Shoemaker** 311

Filosporella exilis sp. nov. on submerged plant debris from Belarus **Vladislav I. Gulis and Ludmila Marvanová** 313

A new variety of *Baggea pachyascus* (Patellariaceae, Ascomycota) from Finland **M. Magnes, Ch. Scheuer, and U. Söderholm** 321

New Australasian Ustilaginales **Kálmán Vánky** 327

The genus *Kretzschmaria* **Jack D. Rogers and Yu-Ming Ju** 345

Pyrenomycetes of British Columbia collected by John Macoun **Margaret E. Barr** 395

Rhytisma americanum sp. nov.: a previously undescribed species of *Rhytisma* on maples (*Acer* spp.) **George W. Hudler, Sandra Jensen-Tracy, and Mark T. Banik** 405

Alternaria themes and variations (224–225) **Emory G. Simmons** 417

The lichen family Parmeliaceae (Ascomycotina) on Lord Howe Island, Australia **Simone H. J. J. Louwhoff and John A. Elix** 429

The chemistry of some species of *Buellia* sensu lato (Lecanorales, lichenized Ascomycotina) **Klaus Kalb and John A. Elix** 465

A new species of *Echinodontium* from Italy **Annarosa Bernicchia and Andrea Piga** 483

Powdery mildew on *Conyza* and *Cosmos* in Turkey **A. Karakaya** 493

Comments on the names Trametaceae, Coriolaceae, and Trametales **Jaques Boidin and Richard P. Korf** 497

Tulostoma portoricense (Tulostomatales, Gasteromycetes) from Mexico **M. Esqueda-Valle, E. Pérez-Silva, T. Herrera, A. Altés, and G. Moreno** 499

Phenetic analysis of genera of the Saprolegniaceae (Oomycetes) **Martha J. Powell and Will H. Blackwell** 505

Book Reviews **Eric H. C. McKenzie** 517

Author Index 521

Index to Fungous and Lichen Taxa 525

Reviewers 535

Errata 535

Publication Date for Volume 67 536

Journal Publication Statement 536

MYCOTAXON

Volume LXVIII, pp. 1–7 July-September 1998

REVISED INSTRUCTIONS TO AUTHORS

Mycotaxon is an international journal for articles on the taxonomy and nomenclature of fungi. Publication is open to all persons. No page charges are incurred for papers with fewer than sixty-five (<65) pages and one or fewer halftone plates per ten (10) pages of text. The Editor-in-Chief receives camera-ready copy of manuscripts that have been reviewed prior to submission by an expert(s) in the field. The author is responsible for obtaining and documenting peer review of the manuscript, and preparing *camera-ready copy.* It falls to the author to prepare concise, well-formatted copy, free of error, that accurately conveys the author's ideas in an economy of space.

Determine that the work is suitable for publication in Mycotaxon

Mycotaxon is restricted to papers on the taxonomy and nomenclature of fungi. We intend this broadly, to include not only monographic work or arguments dealing with specific nomenclatural problems: we will also accept papers devoted to floristics, reviews of taxonomic groups or of taxonomic criteria, nomenclatural and taxonomic argumentations and polemics, proceedings of symposia on taxonomic or nomenclatural matters, subject, title or taxon indices of taxonomists' writings, etc. Papers that deal with ecology, cytology, physiology, pathology, ultrastructure, molecular biology, etc., unless their *primary* focus is taxonomic, should be submitted to another journal. Prospective authors are encouraged to send a draft of their manuscript to the Editor-in-Chief for a decision on the suitability of a manuscript for publication in the journal.

Articles may be of any length. A maximum of sixty-four (64) free pages per author (based on senior authors) is permitted in any one year. Partial costs of publication will be charged beyond sixty-four pages for each excess page (the current charge for excess pages is $18.00 per page). Similarly, authors are allowed one photographic halftone plate for each ten pages of manuscript (an eleven-page manuscript thus qualifies for two halftone plates, a twenty-one-page manuscript qualifies for three, etc.). Authors who wish to publish papers with halftones in excess of this allowance must be prepared to pay for the extra cost of these (currently, $18.00 per extra plate).

Prepare a fully formatted draft of the manuscript

Decide which of the three standard formats you will employ for your manuscript. You may choose from 100%, Elite (88% reduction), and Pica (73% reduction). Consider what style of type is available on your typewriter or what type fonts, reduction capability, and margin settings (especially top and bottom margins) are available on your wordprocessor and printer. Many authors find it useful to draw a square matching the format dimensions on a piece of paper in a dark or colored ink that can serve as a template to check that the manuscript pages conform to the specified dimensions:

Reduction	Page Dimensions	Font	Blank space, page 1
100% (no red.)	17.6 x 11 cm	8 pt	1.8 cm
88% (Elite)	20 x 12.5 cm	10 pt	2 cm
73% (Pica)	24 x 15 cm	12 pt	2.4 cm

Note the amount of blank space to be left at the top of page one. Your text on the title page will be that much shorter than succeeding pages. The *Mycotaxon* header will be inserted there by the editor. While *Mycotaxon* authors enjoy greater freedom than most in composing their papers, a few recommendations should guide the design of your article. Articles may be written in either English or French. The standard elements of an article are the title, author(s)' name and address, abstract, keywords, main text, and literature cited.

- *TITLE.* All titles should be in **BOLD UPPERCASE** letters throughout, to set them off from the body of the text, and italics must NOT be used in titles. As most readers will judge by the title whether to read your article, make the title informative yet concise. Include in the title the taxa that are the focus of your paper, but omit the names of authorities. Titles in which author citations appear will result in **automatic rejection** for reformatting unless a covering letter explaining why an author citation in the title is critical accompanies the manuscript. Avoid abbreviations.
- *AUTHOR(S)' NAME AND ADDRESS.* Give the name of the author or authors and their mailing addresses and, if desired, your E-mail address at the end.
- *ABSTRACT.* Construct a paragraph that summarizes the paper and is meaningful if read alone and apart from the remainder of the paper. Include all conclusions, especially new taxa and new combinations. Always prepare one abstract in English or French. One or two additional abstracts may be added to summarize a *longer* paper in other languages.
- *KEYWORDS.* Authors are encouraged to insert a heading for keywords, and a list of up to five such keywords, often used by abstracting services.
- *MAIN TEXT. Briefly* introduce the reader to your subject, citing the significant prior literature. Present your work with emphasis on what is new to science in your report. When describing new taxa and proposing new combinations, take care to comply with the current *International Code of Botanical Nomenclature.* Overall, be concise and document your ideas and observations. For authorities of taxa use standard abbreviations as listed in *Authors of plant names* (R. K. Brummit & C. E. Powell, Kew, 1992). Acronyms for herbaria and collections given in *Index Herbariorum* (P. K. Holmgren & al., eds., Bronx, 1990) should be followed.
- *LITERATURE CITED.* Be sure to list all references cited in the text, and also check that all references in the literature cited section are cited in the main text. Use a standard form for abbreviating titles. The abbreviations used in *B-P-H. Botanico-Periodico-Huntianum* (G. H. M. Lawrence & al., eds., Pittsburg, 1968), *B-P-H/S. Botanico-Periodico-Huntianum/Supplementum* (G. D. R. Bridson, ed., Pittsburgh, 1991), and F. Stafleu and R. Cowan's *Taxonomic Literature* (2nd ed., vol. 1–7, Utrecht, 1976–1988, and supplements, vol. 1–3, by F. A. Stafleu & E. A. Mennenga, Königstein, 1992–1995) are recommended. Do not separate citations by a blank line. Use single-spacing throughout.

Prepare camera-ready copy

DETERMINE THE SIZE AND PLACEMENT OF ILLUSTRATIONS. All articles published in *Mycotaxon* begin on an odd-numbered, *i.e.*, right-hand page. With this in mind, plan the size and placement of illustrations within the text. When possible, place an illustration within or facing the page of text where the illustration is first mentioned (preferably inserted on an odd numbered page). Unlike the text, illustrations may be submitted in any size. Figure 1 presents one method for calculating the proportionate reduction of figures. Alternatively, many authors find it simplifies the process of determining reduction to prepare illustrations that conform to one of the three standard formats (100%; 88% - Elite; 73% - Pica). The reduction option available on many photocopiers is another useful tool for checking a reduction calculation and even reducing line drawings to insert into the text. Beware of overreduction. A line drawing may fade to nothing if overreduced. On the other hand, a simple diagrammatic outline of, *e.g.*, two or three cells, does not warrant a full-page illustration. Consider grouping drawings to aid comparison of species by the reader, and to keep the page length of an article to a minimum. If possible, keep legend(s) on the same page as the illustration.

Line drawings are reproduced by the same process as the text of the article. Thus, the line drawings can be easily inserted into the text, and the caption printed directly below or to the side of the drawing. As the printer's camera does not see the edges of cut paper, cut and paste illustrations and captions to assemble an attractive arrangement.

Photographs are reproduced by a separate, halftone screen. If photographs are grouped to form a plate, take care that the contrast among the photographs is not too great. Photographs may fill the height of the page or less, but usually photographs should fill the full *width* of the page. After planning the size and placement of a photographic plate, do not attach it to text page. Rather, mount each photographic plate on a separate sheet of white, heavy paper or board. Allow enough margin around the photograph for editorial markings and printer's directions. Write the author's name on the top margin or reverse of the board. Captions are printed along with the text of the paper, not on the photographic plate. The camera-ready manuscript page will bear the caption and any other text, but only blank paper where the corresponding halftone will be inserted by the printer. If the halftone plate fills a whole page, plan the text accordingly and print the caption so that it will appear on the *facing* page. Bear in mind that halftone reproduction is an extra printing expense and authors are limited to one halftone per ten pages of text. The charge for extra halftones is currently $18.00 per halftone plate.

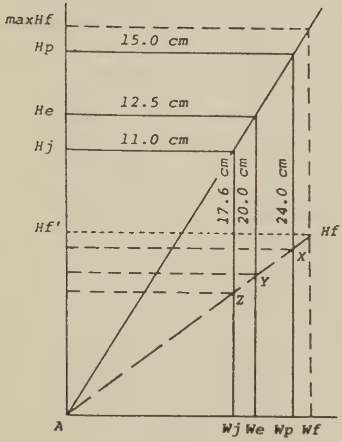


Fig. 1. THE DIAGONAL METHOD OF PLATE PREPARATION. Solid rectangles are the standard format sizes for *Mycotaxon*. *A-Wj* = 100% width of journal format: 11 cm. *A-Hj* = 100% height of journal format: 17.6 cm. *A-We* = width of Elite format: 12.5 cm. *A-He* = height of Elite format: 20 cm. *A-Wp* = width of Pica format: 15 cm. *A-Hp* = height of Pica format: 24 cm. *A-Wf* = actual figure width. *A-maxHf* = maximum permitted figure height of a figure *A-Wf* wide = 1.6 x *A-Wf*. *A-Hf'* = *Wf-Hf* = observed height of figure *A-Wf* wide. *Wp-X* = derived (measurable) height to be kept blank on a Pica format manuscript to allow insertion by the printer of a figure *A-Wf-Hf-Hf'*. *We-Y* = derived (measurable) height to be kept blank on an Elite format manuscript for the same purpose. *Wj-Z* = printed height of such a figure.

In our ongoing effort to improve the professional appearance of the journal we are enforcing some criteria which may result in **automatic rejection** of papers which require reformatting to meet these criteria. The following points should be carefully followed to ensure that your paper is not rejected on formatting grounds:

- *EMPLOY SINGLE-SPACING THROUGHOUT THE PAPER.* The final, camera-ready copy must be single-spaced throughout. Single blank lines may be used to separate paragraphs. Never use blank lines to separate entries in the literature cited section.
- *CHOOSE CORRECT NUMBER OF LINES PER PAGE.* Authors frequently use too much space between lines or too large or too small a typeface (remember that many manuscripts are reduced when published). On a typical full page there should be between 40 and 46 lines. If some part of the page is data not meant to be "read" (*e.g.,* Latin diagnoses, specimens examined), that portion can be rendered in a smaller typeface resulting in more lines on that page. Remember to try to save space in references cited: never use blank lines between references, and consider using a smaller typeface and closer line spacing for this part of the manuscript.
- *NEVER USE UNDERLINING.* To achieve emphasis use italic typeface or use bold typeface or exceptionally you may wish to use bold italic typeface. Underlining is *never* used in printed publications, and when used on a typewriter it means "put this in italic typeface" to a printer, or adds emphasis in a handwritten document where italic typeface is not available. Though underlining is an easy option when using a computer, never use it when preparing camera-ready manuscripts.
- *DECIDE WHAT TEXT MATTERS NEED EMPHASIS.* Use **bold face** for the title and for names of all new taxa at all ranks at the point in the text where they are formally described. Latin names of taxa at generic rank and below should otherwise be in *italics,* and names of taxa above generic rank in normal typeface. Occasional use of bold face for headings or for names of taxa within keys may be pleasing. You can also emphasize headings by the use of UPPERCASE or of LARGE AND SMALL CAPS.
- *HEADINGS AND SUBHEADINGS MUST NOT APPEAR AS THE BOTTOM LINE OF THE PAGE.* Do not end any heading by a period (it is not a sentence).
- *DO NOT PRINT HEADERS OR PAGE NUMBERS ON THE CAMERA-READY COPY.* A common error occurs when author's names and page numbers added to the manuscript as headers are captured by the printer's camera. To avoid this problem, do not add names or page numbers as printed headers. Rather, add the author's name and page numbers using a soft or non-photoreproducing blue pencil at the top of the page.
- *MAKE A FINAL CHECK FOR SPELLING AND GRAMMATICAL ERRORS.* It is the responsibility of the author to proofread the manuscript for spelling, typographic and grammatical errors. Special attention should be given to Latin diagnoses. Ask someone fluent in English (or French) to proofread the paper if you are not. Two common spelling errors are (i) mistakes in the author's own name and address, and (ii) names of taxa are spelled one way in the text and another way in the caption of an illustration.
- *PRINT CAMERA-READY MANUSCRIPT ON LETTER-SIZE OR A4 PAPER.*

Obtain presubmission review and revise the paper accordingly

Mycotaxon is unusual among scientific journals in that it is the responsibility of the authors to obtain reviews of their papers before submitting the manuscript to the Editor-in-Chief. Send a copy of your fully formatted manuscript to a scientist *outside of the author's home institution* for critical comment. For longer articles, 20 pages or more in length, *two* reviewers are required. Any author who is uncertain whom to approach for a review of a manuscript is encouraged to send a draft or summary to the Editor-in-Chief. The editor will then suggest several researchers in the author's area of study. The reviewer's comments must be mailed to the Editor-in-Chief when a manuscript is submitted to the journal for publication. Authors are expected to respond to reviewer's comments by revising the manuscript. If the author disagrees with the reviewer, the discrepancy should be addressed in the cover letter to the editor. At the close of each volume of *Mycotaxon* the names of all those who provided pre-submission reviews will be separately acknowledged by the editors of the journal.

It is the *author's responsibility* to provide each reviewer with a copy of the *Reviewer's Guidelines for Mycotaxon Articles* or to advise the reviewer that these *Guidelines* appear in *Mycotaxon* 68: 9-10, 1998 and are also posted on the journal's Web page.

Be prepared to *revise your pages* when reviewer's suggestions may change where pages ended in the version sent to the reviewer. *Double check* that the changes have not resulted in any "widows" or "orphans" (single lines at the bottom or top of a page). For submission, always print on only one side of the paper, regardless of format.

Save an extra copy of the manuscript as a computer file or photocopy

As insurance against loss in the mails, save an author's copy of the camera-ready manuscript either as a computer file or as a photocopy. Also, authors are asked to mail a photocopy of the *final* manuscript to the editor along with the camera-ready copy on which the Editor will insert the Mycotaxon header and page numbers. The photocopy will be used by the Index Editor.

Prepare a covering letter to the editor

Address your letter and English Language manuscripts to:
Pavel Lizoň, Editor-in-Chief, Mycotaxon
Plant Pathology Herbarium
Cornell University
401 Plant Science Bldg.
Ithaca, NY 14853-4203, USA
Address your letter and French Language manuscripts to the French Language Editor:
Grégoire L. Hennebert
32 Rue de l'Élevage
B-1340 Ottignes-LLN, Belgium

In your covering letter provide the following information about your manuscript:

i. Title of the article,
ii. Format: 100%, 88% - Elite, or 73% - Pica,
iii. Number of pages,
iv. Names of the reviewers and their institutional affiliations (at least two reviewers if the paper is more than 20 pages long),
v. Statement and/or explanation about reviewer's comments if not accepted,
vi. If the manuscript is longer than sixty-four (64) pages or if the number of halftone plates exceeds one plate per ten pages of manuscript, indicate your willingness to accept the excess page or plate charges, and
vii. Corresponding author's mailing address, E-mail address, and fax number.
viii. If there are *any* accent marks associated with an author's name when spelled in upper and lower case, be *certain* to advise the editor so that the name can be correctly indexed. We recommend authors' names after the title also be in UPPERCASE or in LARGE AND SMALL CAPITALS.

Assemble the manuscript for mailing

i. cover letter,
ii. reviewer's comments, including reviewer's checklist and MS annotations,
iii. camera-ready manuscript,
iv. halftone plates, if any, and
v. one photocopy of the camera-ready manuscript.

Consult the two-page **Author's Checklist** below as a final check of the readiness of the manuscript. And finally, **pack the manuscript securely** for the mails.

Offprints of your published article

One hundred (100) offprints of each article will be mailed to the corresponding author. Authors who require more than 100 copies of their articles may request at an additional charge (currently $20) that the negatives of their article be mailed to them so that they may hire a local printer to produce their own photo-offset reprints. Alternatively, some authors find that high quality photocopies are suitable reprints at less expense.

AUTHOR'S CHECKLIST

☐ PAGE FORMAT **is very important**
  - ✓ Conforms to one of the three formats that are standard for *Mycotaxon*: 100% - 17.6 x 11 cm - 8 point font; 88% (Elite) - 20 x 12.5 cm - 10 point font; 73% (Pica) - 24 x 15 cm - 12 point font.
  - ✓ No headers or page numbers are printed on camera-ready manuscript pages. These may be added after printing using a soft pencil, or better, a non-photoreproducing blue pencil. Keep all such notations far away from the text.
  - ✓ Keep in mind that the author is both *designer and printer* of the paper and that the editor cannot change submitted text.

☐ TITLE
  - ✓ Is printed in **BOLD UPPERCASE.**
  - ✓ Starts at the prescribed distance from top margin of page 1: 100% - 1.8 cm; 88% - 2 cm;73% - 2.4 cm.

☐ SINGLE-SPACING
  - ✓ Is used throughout text of article. At most, a single blank line may be inserted between sections or paragraphs.
  - ✓ **No blank lines** are used to separate references in the literature cited section.

☐ ALL ILLUSTRATIONS
  - ✓ Check reduction calculations.

❒ PHOTOGRAPHS
- ✓ Photographs after reduction should normally fill the entire width of the page unless text or a legend takes part of the width.
- ✓ Are mounted separately from the text on heavy paper or board with ample margins for editor's and printer's marks.
- ✓ Captions are printed within the text, not on the photographic plate.

❒ FORMAT
- ✓ Check **again** to assure yourself that your paper will not be rejected on formatting grounds.

❒ SAVE A COPY OF THE MANUSCRIPT FOR YOURSELF

❒ MAIL TO THE APPROPRIATE EDITOR
- ✓ Cover letter
- ✓ Camera-ready copy
- ✓ Reviewers' comments, including reviewer's checklist, etc.
- ✓ Photocopy of final, camera-ready manuscript for Index Editor

❒ STILL QUESTIONS?

Contact the Editor-in-Chief:
Pavel Lizoň
Plant Pathology Herbarium
Cornell University
401 Plant Science Bldg.
Ithaca, NY 14853-4203, USA
Fax: (607) 255-4471
E-mail: PL18@cornell.edu

or check FAQ on the *Mycotaxon* Web page
<www.mycotaxon.com>

MYCOTAXON

Volume LXVIII, pp. 9-10 July-September 1998

GUIDELINES FOR REVIEWERS
of papers submitted for publication in Mycotaxon

If you have been selected by the author(s) of a paper prepared for this journal to act as a pre-submission reviewer, remember that your duties, should you accept that request, far exceed the duties you normally exercise as a reviewer. You will have received what the author hopes is a fully formatted article, exactly as he or she envisions it will appear in print (except that the paper as you view it will probably be reduced: *Mycotaxon* page width is 11 cm).

For many authors this will be their first experience of being an editor and printer, for they must prepare camera-ready copy which the Editor cannot change. You will be asked to judge not merely the scientific content, but also the format and esthetic appearance of the article.

Here are some general points for you to review:

The journal *Mycotaxon* accepts only papers devoted to the taxonomy and nomenclature of fungi, including floristics, reviews of taxonomic groups or of taxonomic criteria, and nomenclatural and taxonomic argumentation.

Authors submit camera-ready peer-reviewed manuscripts to the Editor-in-Chief for a decision on the suitability of a manuscript for publication in the journal.

Authors are fully responsible for preparing concise, well-formatted copy, free of error, following published Instructions to Authors.

There is no limitation on the length of an article.

It will be your duty to determine if possible whether
- the paper is suitable for the journal's restricted audience of taxonomists and systematists
- the title is informative, clearly stating which taxa are the focus of the paper
- the text is concise, and clearly explains the topics, methodologies, presented data, and conclusions
- the illustrations are instructive and captions unambiguously explain pictured details (including magnifications)
- the nomenclature of all taxa complies with the latest edition of the International Code of Botanical Nomenclature
- the standards for authorities of taxa, literature citation, collection acronyms, etc. are followed
- the style and grammar of English (or French) is properly used
- the manuscript is formatted in accordance with *Mycotaxon* instructions

If you have questions or doubts about manuscript
- refer to the Instructions to Authors published in *Mycotaxon* 68: 1-7, 1998, which are also posted together with FAQ on the journal's Web page at <www.mycotaxon.com/instructions.html>, or
- contact the Editor-in-Chief, Pavel Lizoň, at <PL18@cornell.edu>

On completion of your review, complete the form below and return it to the author along with your detailed review and the manuscript if you marked any changes there. Please place a check mark on one of each pair of alternatives.

REVIEWER'S CHECK LIST

Reviewer's Name:
Postal Address:

E-mail address:
Telephone #: **FAX #:**

I ☐ HAVE made annotations directly on the manuscript which I return herewith, or
I ☐ HAVE NOT made such annotations, and do not return the manuscript.

I ☐ HAVE ☐ HAVE NOT
attached a comment letter on the manuscript.

I ☐ HAVE ☐ HAVE NOT
determined that the paper is suitable in content for *Mycotaxon*.

I ☐ HAVE ☐ HAVE NOT
accepted that the title as submitted is appropriate.

I ☐ HAVE ☐ HAVE NOT
found the text acceptable, or provided alternatives for improvement.

I ☐ HAVE ☐ HAVE NOT
accepted all the illustrations as necessary and useful as presented.

I ☐ HAVE ☐ HAVE NOT
checked your nomenclature against the *Code of Nomenclature*

I ☐ HAVE ☐ HAVE NOT
checked your authority citations, literature citations, and collection acronyms.

I ☐ HAVE ☐ HAVE NOT
checked your grammar to the best of my ability.

I ☐ HAVE ☐ HAVE NOT
approved of your formatting of this paper, and approved of the esthetics of figure placement, choice of typeface(s), etc., or if I have had suggestions for changes I have noted those on the manuscript or in my attachment letter.

I understand that you are required to return this Reviewer's Check List and any attached comments and suggestions along with your finally formatted paper when you submit it to the journal for acceptance or rejection.

Reviewer's Signature:

MYCOTAXON

Volume LXVIII, pp. 11-17 July-September 1998

NOTES ON CONIDIAL FUNGI. XVII. AMPHOPHIALIS,ANAM.GEN. NOV.

R.F. Castañeda Ruíz[1], B. Kendrick[2] and J. Guarro[3]

[1] Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt" (INIFAT) Calle 1 esq. 2 Santiago de las Vegas, Ciudad Habana, Cuba. CP. 17200.

[2] 8727 Lochside Drive, Sidney, B.C. V8L IM8, Canada.

[3] Unitat de Microbiologia. Facultat de Medicina i Ciencies de la Salut, Universitat Rovira i Virgili, 43201 Reus, Tarragona, Spain.

ABSTRACT

Amphophialis concinna *anam. gen. et sp. nov.*, characterized by cylindrical, capitate, brown conidiophores and acircular to filiform, one-celled, hyaline conidia, is described and illustrated. The conidiogenous cells are mono- and polyphialidic, flask-shaped and aggregating tightly packed on the terminal, occasionally swollen cells. It was found on fallen rotten leaves of *Bauhinia divaricata* in a undisturbed rainforest near a river in Cuba. The new combination ***Kionachaeta pleomorpha*** is proposed.

Key words: ***Amphophialis concinna***, ***Kionochaeta pleomorpha***, hyphomycetes, rainforest, litter, Cuba.

RESUMEN

Se describe e ilustra ***Amphophalis concinna*** *anam. gen. et sp. nov.* caracterizada por conidióforos pardos y cilíndricos y por conidios hialinos, de aciculares a filiformes y unicelulares. Las células conidiógenas son mono y polifialídicas, ampuliformes y emergen densamente agrupadas de la célula apical que ocasionalmente es hinchada. Dicha especie fue aislada en un bosque tropical de Cuba sobre hojas caídas de *Bauhinia divaricata*, cerca de un río.

Palabras clave: ***Amphophialis concinna***, ***Kionochaeta pleomorpha***, hifomicetes, selva tropical, hojarasca, Cuba.

TAXONOMY

Amphophialis R.F. Castañeda, W.B. Kendrick et Guarro, *anam. gen. nov.*
Etym.: L. Ampho- meaning of two kinds; phialis- refers to the conidiogenous cells

Ad fungos conidiales, hyphomycetes pertinens. COLONIAE effusae, brunneae. Mycelium partim superficiale et partim in substrato immersum. CONIDIOPHORA macronematosa, mononematosa, simplicia vel ramosa, septata, brunnea. CELLULAE CONIDIOGENAE monophialidicae et polyphialidicae, lageniformes usque ampulliformes, determinatae vel sympodiales, in conidiophoris incorporatae. CONIDIA aseptata, hyalina, filiformia, acicularia vel fusiformia.
Species typica: ***Amphophialis concinna***, *anam. sp. nov.*

Conidial fungi, hyphomycetes. COLONIES effuse, brown. Mycelium superficial and immersed. CONIDIOPHORES macronematous, mononematous, single or branched, septate, brown. CONIDIOGENOUS CELLS monophialidic and polyphialidic, lageniform to ampulliform, determinate or sympodial, integrated. CONIDIA aseptate, hyaline, filiform, acicular to fusiform.
Type species: ***Amphophialis concinna***, *anam. sp. nov.*

Amphophialis concinna R. F. Castañeda, W.B. Kendrick et Guarro, *anam. sp. nov.*
Etym.: L. concinna- meaning pretty and elegant (Figs. 1,2)

Ad fungos conidiales, hyphomycetes pertinens. COLONIAE in substrato naturali effusae, hypophyllae, brunneae. Mycelium plerumque in substrato immersum, ex hyphis septatis, laevibus, breviter ramosis, brunneis, 1.5-2 μm diam. compositum. CONIDIOPHORA macronematosa, mononematosa, erecta, recta, simplicia, interdum ramosa, 35-90 x 8-11 μm, septata, bulbosa ad fundamenta, obtusa vel rotundata ad apicem, levia crassitunicata, brunnea, ex numerosis cellulis conidiogenis in parietibus apicalibus perforationibus praedita. CELLULAE CONIDIOGENAE primo monophialidicae, tarde

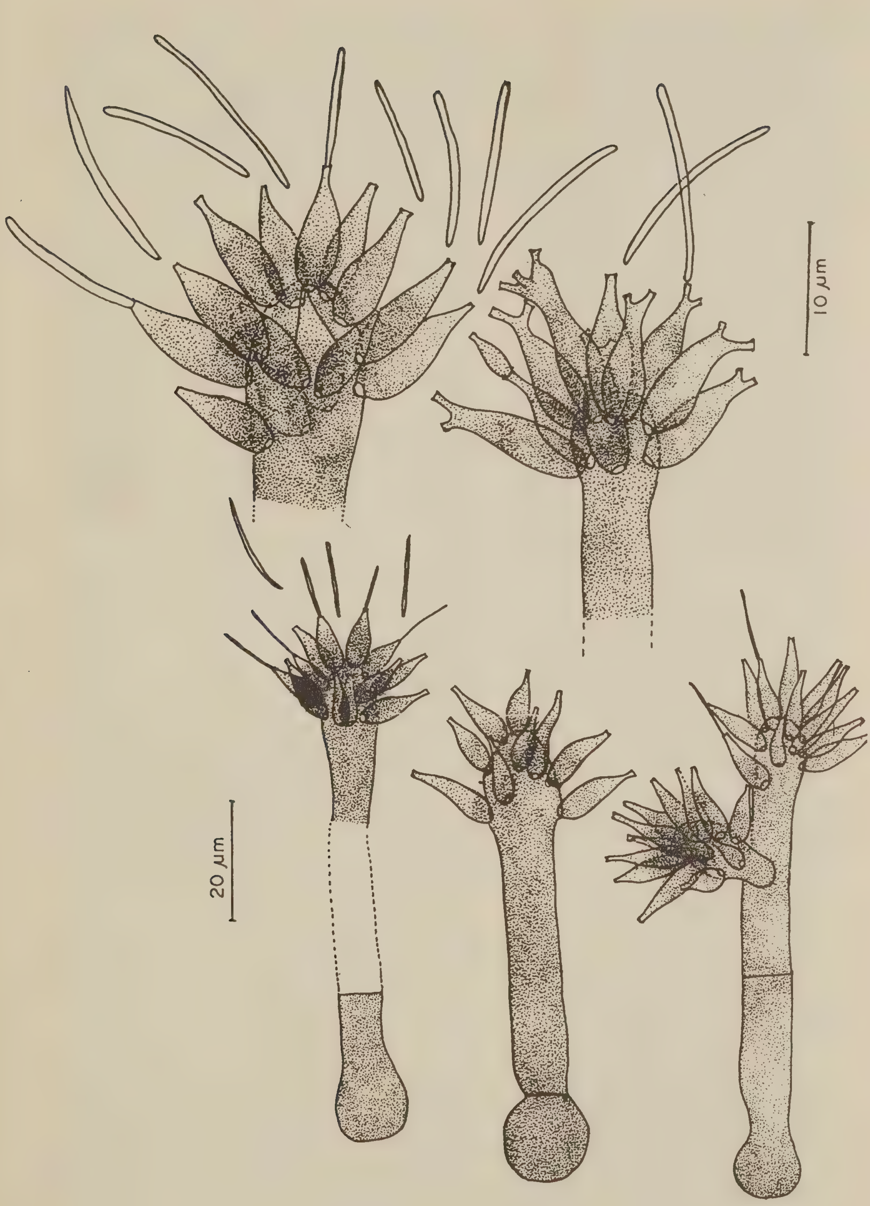


Fig. 1. ***Amphophialis concinna*** (INIFAT C92/43).

mono- et polyphialidicae, determinatae vel sympodiales, raro percurrentes, incorporatae, lageniformes vel ampulliformes, leves, crassitunicatae, dilute brunneae, 10-17 x 2-4 μm, cum collo manifesto 0.5-1.5 μm alto et 0.5-1.0 μm diam praeditae. CONIDIA filiformia vel acicularia, unicellularia, hyalina, leviter curvata, ad apicem rotundata ad basim leniter attenuata, levia, 10-14 x 0.5 μm, in massa mucosa congesta. Teleomorphosis ignota.

Holotypus: INIFAT C92/43, in foliis dejectis *Bauhiniae divaricatae* Lin., in sylva pluvialis circa fluvii, San Antonio de los Baños, La Habana, Cuba, legit R. F. Castañeda et B. Kendrick, 2-II-1992. MUCL 39872 isotypus.

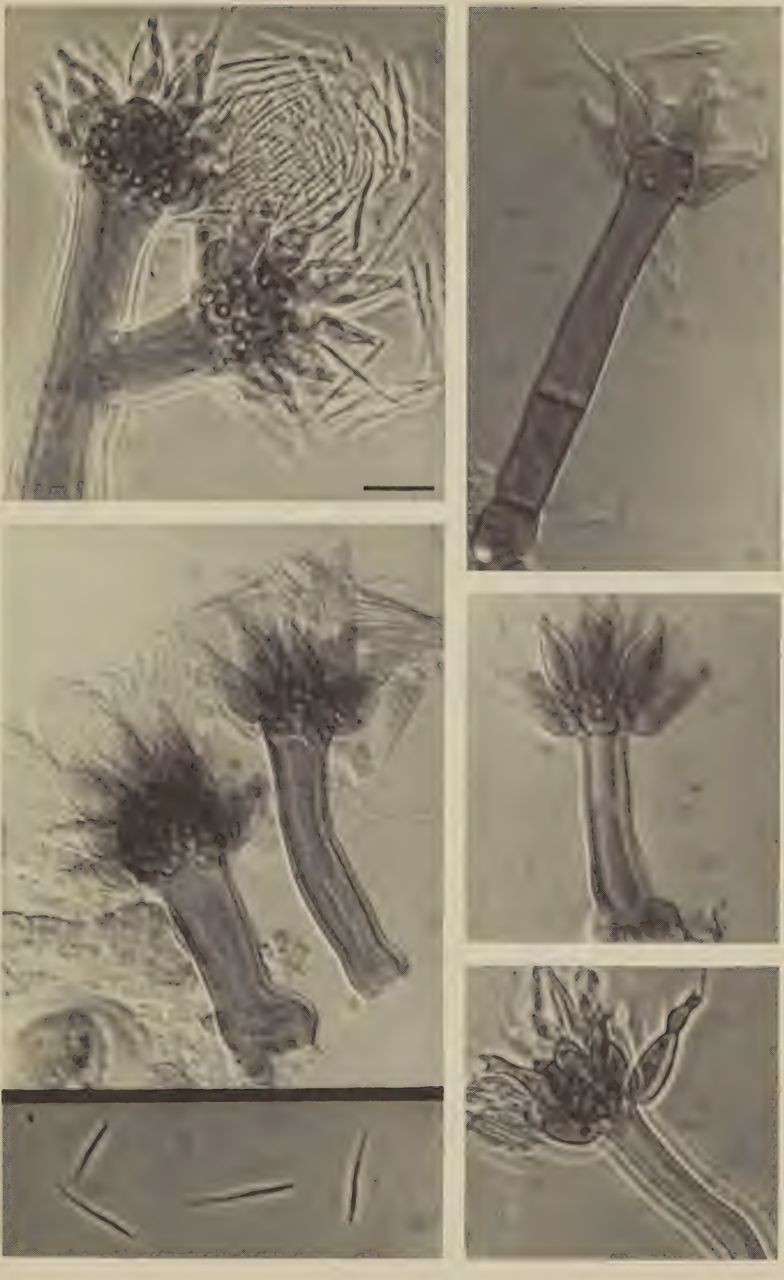
Conidial fungi, hyphomycetes. COLONIES effuse, hypophyllous, brown. Mycelium mostly immersed, composed by septate, smooth-walled, slightly branched, brown, 1.5-2 μm diam. hyphae. CONIDIOPHORES macronematous, mononematous, erect, straight, simple, sometimes branched, 35-90 x 8-11 μm, 1-3-septate, bulbous at the base, swollen towards the apex, bearing several to numerous conidiogenous cells at the apex, smooth- and thick-walled, brown. CONIDIOGENOUS CELLS monophialidic, later mono- and polyphialidic, determinate or sympodial, whole conidiogenous cells rarely percurrent, integrated, lageniform to ampulliform, 10-17 x 2-4 μm, smooth and very thick-walled, pale brown, with a distinct collarette, 0.5-1.5 μm deep and 0.5-1.0 μm wide at each conidiogenous locus. CONIDIA filiform, 0-septate, hyaline, slightly curved, rounded at the apex and slightly attenuated at the base, smooth-walled, 10-14 x 0.5 μm, accumulating in a slimy mass. Teleomorph unknown.

Holotype: INIFAT C92/43, on rotten leaves of *Bauhinia divaricata* Lin, in rainforest near a river, San Antonio de los Baños, La Habana, Cuba, coll. R. F. Castañeda and B. Kendrick, Feb. 2, 1992. MUCL 39872 isotype.

Amphophialis resembles ***Stylaspergillus*** Sutton, Alcorn et Fisher (1992) in the shape of conidia and conidiogenous cells, but the latter has cylindrical, sparingly branched metulae and the conidiogenous cells are always monophialidic. ***Phialocephala*** Kendrick

---

Fig. 2. ***Amphophialis concinna*** (INIFAT C92/43), bar = 10 μm



(1961) also shows some resemblance with ***Amphophialis***, but it has branched conidiophores sometimes with several levels or series of branches and the conidia are usually bacilliform, ellipsoid or ovoid. ***Phialocephala mexicana*** Onofri & Zucconi (1984) could be considered congeneric with ***Amphophialis*** because the conidiogenous cells are acrogenous. The genus ***Amphophialis*** is clearly delimited from ***Kionochaeta*** P.M. Kirk & Sutton (1985) which produces compact clusters of conidiogenous cells arising from the main axis or laterally on setiform conidiophores. Subramanian (1993) described ***Phialocorona***, with ***P. pleomorpha*** as type species; it has an apical crown of phialides on non-setose conidiophores, but the cluster of conidiogenous cells do not resemble ***Amphophialis***; nevertheless ***P. pleomorpha*** shows some similarities with ***Kionochaeta nanophora*** Kuthubutheen & Nawawi (1988) in its conidiogenous apparatus, ***P. pleomorpha*** has bacillar conidia and three associated synanamorphs (***Heteroconium, Selenosporella*** and ***Sporidesmiella***). All these characters separate both species, which are considered congeneric, from ***Phialocorona***, a synonym of ***Kionochaeta***. Therefore, the following new combination is proposed:

Kionochaeta pleomorpha (Subramanian) R. F. Castañeda, *comb. nov.*
Basionym: ***Phialocorona pleomorpha*** Subramanian, *Cryptogamie Mycologie* **14**:53 (1993).

ACKNOWLEDGEMENTS

We are indebted to Dr. Enrique Descals (Inst. Mediterrani d'Estudis Avançats de les Balears, C.S.I.C./U.I.B.) for serving as pre-submission reviewer. We acknowledge the Cuban Ministry of Agriculture for providing facilities.

REFERENCES

Kendrick, W.B. (1961). The *Leptographium* complex. *Phialocephala* gen. nov. *Can. J. Bot.* 39: 1079-1085

Kirk, P.M. & Sutton, B.C. (1985). A reassessment of the anamorph genus *Chaetopsina* (Hyphomycetes). *Trans. Br. mycol. Soc.* 85: 709-718.

Kuthubutheen, A.J. & Nawawi, A. (1988). Two new species of *Kionochaeta* (hyphomycetes) and *K. ramifera* from Malaysia. *Trans. Br. mycol. Soc.* 90: 437-444.

Onofri, S. & Zucconi, L. (1984). Two new species of the genus *Phialocephala*. *Mycotaxon* 20: 185-195.

Subramanian, C.V. (1993). *Phialocorona pleomorpha gen. nov.* and its synanamorphs. *Crypt. Mycol.* 14: 45-54.

Sutton, B.C.; Alcorn, J.L. and Fisher, P.J. (1982). A synanamorph of *Parasympodiella laxa*. *Trans. Br. mycol. Soc.* 79: 339-342.

MYCOTAXON

Volume LXVIII, pp. 19-22 July-September 1998

TWO NEW ASTERINACEOUS FUNGI FROM KARALA, INDIA

V.B. Hosagoudar and T.K. Abraham
Microbiology Division, Tropical Botanic Garden and Research Institute, Palode 695 562, Thiruvananthapuram, Kerala, India

J.L. Crane
Illinois Natural History Survey, 607 East Peabody Drive, Champaign, Illinois 61820-6970, U.S.A.

Summary

This paper gives an account of two new species, namely, *Asterina saracae* and *Lembosia terminaliae-chebulae*, collected from Kerala, India.

1. *Asterina saracae* Housagoudar, Abraham & Crane sp. nov. (Fig. 1)

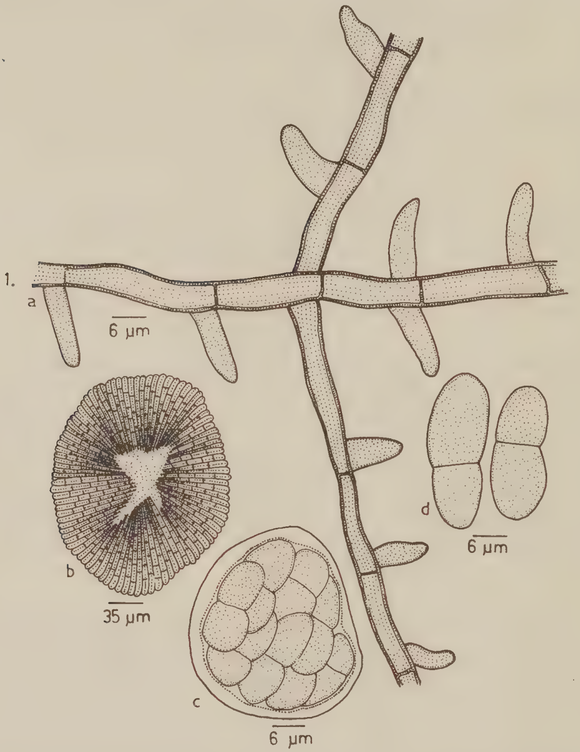
Coloniae epiphyllae, subdensae vel densae, dispersae, ad 2 mm diam., confluentes. Hyphae rectae vel subrectae, alternae, oppositae vel irregulariter ad angulos acutas, laxe reticulatae, cellulae 19-22.5 × 4.5-6.5 µm. Hyphopodia alternata, ad 20% opposita, unicellula, conoidea vel ampullacea, attenuata ad apicem, late rotundata ad apicem, integra, 11-16 × 4.5 µm. Thyrothecia dispersa vel laxe aggregata, saepe connata, orbicularia vel ovala, 196-294 × 176-196 µm, stellato dehiscentes ad centro, margine crenata; asci globosi vel ovati, octospori, 35-38.5 × 27-30.5 µm; ascosporae conglobatae, bi-cellulae, constrictae ad septae, cellulae inferiorae brevibus, 25-29 × 11-13 µm, parietis glabrus.

Colonies epiphyllous, subdense to dense, scattered, up to 2 mm in diameter, confluent. Hyphae straight to substraight, branching alternate, opposite to irregular at acute angles, loosely reticulate, cells 19-22.5 × 4.5-6.5 µm. Hyphopodia alternate, about 20% opposite, unicellular, conoid to ampulliform, tapering towards apex, broadly rounded at the apex, entire, 11-16 × 4-5 µm. Thyrothecia scattered to loosely grouped, often connate, orbicular to oval, 196-294 × 176-196 µm, stellately dehiscence at the centre, margin crenate; asci globose to ovate, octosporous, 35-38.5 × 27-30.5 µm; ascospores conglobate, 2-celled, constricted at the septum, one cell smaller, 25-29 × 11-13 µm, smooth walled.

Holotype: On leaves of *Saraca asoca* (Roxb.) De Wilde (Caesalpiniaceae), in the garden of Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram, Kerala, India, Dec. 5, 1996, V.B. Hosagoudar HCIO 42413. *Isotype*: ILLS 53101.

Some thyrothecia were oval and had longitudinal slits reminiscent of the genus *Lembosia* Lév.; but most were orbicular and stellately dehisced at the centre. Hence, the present collection is accommodated in the genus *Asterina* Lév. *Asterina ciferriana* Petrak and *Asterina (Englerulaster) contigua* Sydow are known on *Caesalpinia crista*

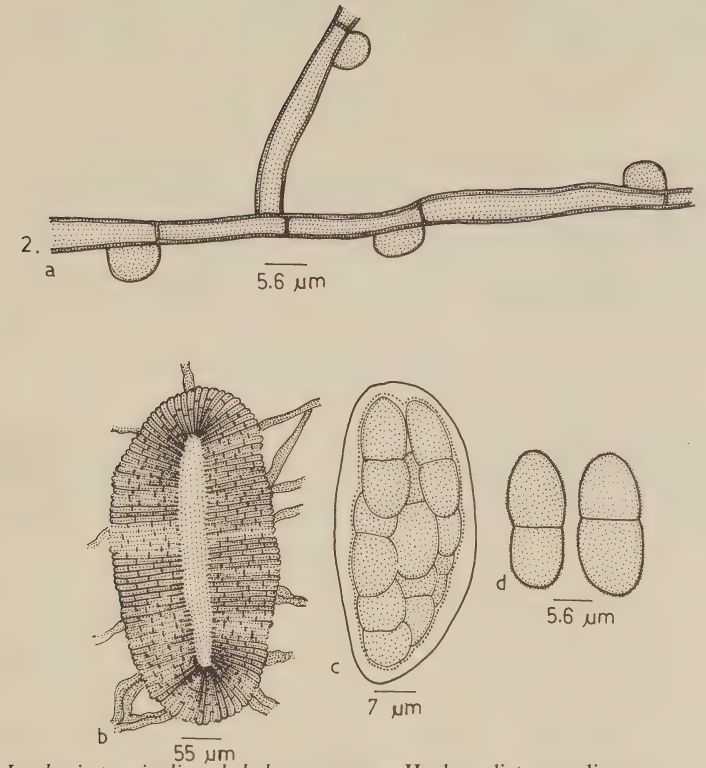
L. from Dominican Republic and *Dialium heudeloti* in sched. from Sierra Leone (Petrak & Ciferri, 1932; Sydow, 1938). *Asterina (Englerulaster) contigua* Sydow appears to be a doubtful species of the genus *Asterina* because the mycelium is devoid of hyphopodia. The present new species is compared with *A. ciferriana* Petrak but differs from it in having 20% opposite and longer hyphopodia, in the absence of primary and secondary hyphae, and in having smaller ascospores.



1. *Asterina saracae* sp. nov. a= Hyphopodiate mycelium; b= Thyrothecium; c= Ascus; d= Ascospores.

Lembosia terminaliae-chebulae Housagoudar, Abraham & Crane sp. nov. (Fig. 2)

Coloniae epiphyllae, densae, ad 2 mm diam., confluentes et formans magniorae. Hyphae subrectae, irregulariter remosae, laxe reticulatae, cellulae 14-18 × 3-4 µm. Hyphopodia dispersa, unicellula, mammiformia, integra, crassa posita, 7-9 µm crassa et 6-7 µm alta. Thyrothecia ovala, ellipsoidea, elongata, forma varie similis X et Y, perumque confluent, dehiscentes longitudinalis et secundum brachium, 390-540 × 190-250 µm, margine crenata vel fimbriata; asci globosi vel ovati, octospori, 48-65 × 19-24 µm; ascosporae oblongae, conglobatae, 1-septatae, leniter constrictae, hyalinae ad initio, brunneae ad maturitati, 17-22.5 × 9-11 µm, parietis verrucosis vel tuberculatis.



2. *Lembosia terminaliae-chebulae* sp. nov. a= Hyphopodiate mycelium; b= Thyrothecium; c= Ascus; d= Ascospores

Colonies epiphyllous, dense, up to 2 mm in diameter, confluent forming large patches. Hyphae substraight, branching irregularly, loosely reticulate; cells 14-18 × 3-4 µm. Hyphopodia scattered, unicellular, mammiform, entire, broad based, 7-9 µm broad and 6-7 µm high. Thyrothecia oval, ellipsoidal, elongated, of various shapes like X and Y, closely confluent, split longitudinally and also along arms, 390-540 × 190-250 µm, margin crenate to fimbriate; asci globose to ovate, octosporous, 48-65 × 19-24 µm; ascospores oblong, conglobate, 1-septate, slightly constricted at the septum, initially hyaline, later becoming brown, 17-22.5 × 9-11 µm, wall verrucose to tuberculate.

Holotype: On leaves of *Terminalia chebula* Retz. (Combretaceae), in the garden of Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram, Kerala, India, Nov. 13, 1996, V.B. Hosagoudar. TBGT 135. *Isotype*: ILLS 53102.

Epiphyllous colonies, larger thyrothecia and smaller ascospores distinguish the present new species from *Lembosia terminaliae* Hansf., reported on *Terminali*a sp. from New Guinea (Hansford, 1957).

ACKNOWLEDGEMENTS

Financial assistance was received from the Forest Department, Government of Kerala. The authors thank Dr. P. Pushpangadan, Director, Tropical Botanic Garden and Research Institute, Palode, for his encouragement and Mr. Tom Rice, Illinois Natural History Survey, for technical assistance in the preparation of this paper. Mrs. Betty Nelson typed two revisions of the paper and Drs. Almut G. Jones, University of Illinois, and Lori M. Carris, Washington State University, read the manuscript.

REFERENCES

Hansford, C.G. 1957. Australian fungi - IV. New records and revisions. *Proc. Linn. Soc. New South Wales* 82: 209-229.

Petrak, F. and Ciferri, R. 1932. Fungi Dominici. *Ann. Mycol.* 30: 149-353.

Sydow, H. 1938. Novae fungorum species - XXVI. *Ann. Mycol.* 36: 156-197.

MYCOTAXON

Volume LXVIII, pp. 23-32 July-September 1998

NOTES ON CONIDIAL FUNGI. XVIII. NEW SPECIES OF PSEUDOMICRODOCHIUM AND REFRACTOHILUM FROM RAINFOREST LITTER

R.F. Castañeda Ruíz[1], B. Kendrick[2] and J. Guarro[3]

[1] Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt" (INIFAT) Calle 1 esq. 2, Santiago de las Vegas, Ciudad Habana, Cuba. CP. 17200.

[2] 8727 Lochside Drive, Sidney, B.C. V8L IM8, Canada.

[3] Unitat de Microbiologia. Facultat de Medicina i Ciencies de la Salut, Universitat Rovira i Virgili, 43201 Reus, Tarragona, Spain.

ABSTRACT

Pseudomicrodochium nectandrae *anam. sp. nov.*, found in forest litter on dead leaves of *Nectandra coriacea* (Sw.) Griseb and ***Refractohilum mycophilum*** *anam. sp. nov.*, found on ascomata of *Xylaria* Hill ex Grev. *sp.* are described and illustrated. The former is characterized by the cylindrical to obclavate, filiform, one-celled, hyaline conidia and the latter is distinguished by its obclavate, 3-13-distoseptate, hyaline conidia.

Key words: ***Pseudomicrodochium nectandrae, Refractohilum mycophilum***, tropical fungi, litter, rainforest, mycophilous, hyphomycetes, systematics.

RESUMEN

Se describen e ilustran dos nuevas especies anamórficas, ***Pseudomicrodochium nectandrae*** sobre hojas muertas de *Nectandra coriacea* (Sw.) Griseb en hojarasca forestal y ***Refractohilum mycophilum*** sobre ascomas de *Xylaria* Hill ex Grev. *sp.* La primera se caracteriza por sus conidios cilíndricos a obclavados, filiformes, unicelulares e hialinos y la segunda por presentar conidios obclavados con 3-13 distoseptos e hialinos.

Palabras clave: ***Pseudomicrodochium nectandrae***, ***Refractohilum mycophilum***, hongos tropicales, hojarasca, pluvisilva, micófilo, hifomicetes, sistemática.

TAXONOMY

Pseudomicrodochium nectandrae R. F. Castañeda, W.B. Kendrick et Guarro, *anam. sp. nov.* (Figs. 1,2 a-e)

Ad fungos conidiales, hyphomycetes pertinens. COLONIAE in substrato naturali effusae, velutinae usque ad gossypinae, hypophyllae, raro amphigenae, albae. Mycelium partim superficiale et partim in substrato immersum; ex hyphis septatis, ramosis, laevibus, hyalinis, 1-1.5 μm diam. compositum. CONIDIOPHORA in cellulis conidiogenis reducta. CELLULAE CONIDIOGENAE monophialidicae, determinatae, subulatae, cylindraceae usque ad sublageniformes, laeves, hyalinae, 5-14 x 1.5-2 μm. CONIDIA filiformia usque ad subobclavata, obtusa ad apicem, interdum guttulata, unicellularia, sicca, levia, hyalina, 28-41 x 1.5-2 μm. Teleomorphosis ignota.

Holotypus: INIFAT C92/42-3, in foliis dejectis *Nectandrae coriaceae* (Sw.) Griseb, in sylva pluvialis, San Antonio de los Baños, La Habana, Cuba. leg. R.F. Castañeda, 2-II-1992, (MUCL 39873 isotypus).

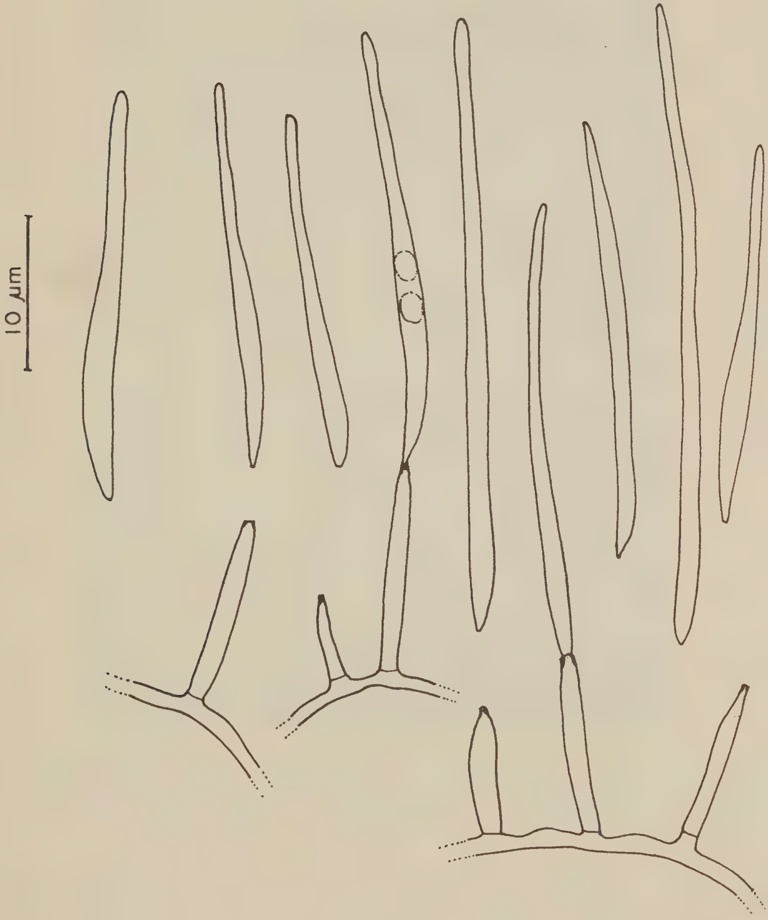


Fig. 1.- ***Pseudomicrodochium nectandrae*** (INIFAT C92/42-3)

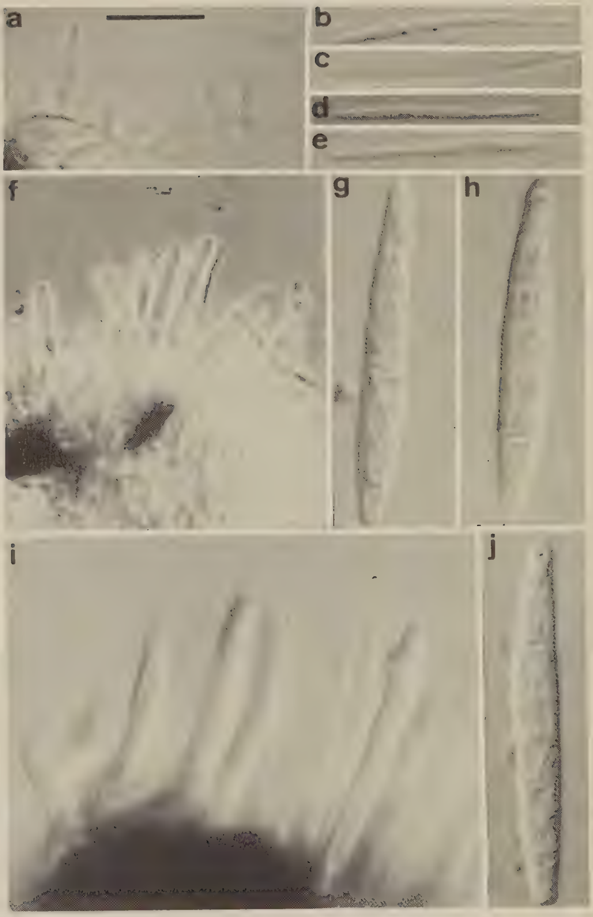


Fig. 2.- a-e, ***Pseudomicrodochium nectandrae*** (INIFAT C92/42-3). a, conidiogenous cells; b-e, conidia. f-j, ***Refractophilum mycophilum*** (INIFAT C91/229). f,i, conidiophores. g,h,j, conidia. Bar = 10 μm except in f which is 60 μm.

Conidial fungi, hyphomycetes. COLONIES on the natural substratum effuse, velvety to cottony, hypophyllous, rarely amphigenous, white. Mycelium partly superficial and partly immersed, composed of septate, branched, smooth-walled, hyaline hyphae, 1-1.5 μm diam. CONIDIOPHORES reduced to conidiogenous cells.

CONIDIOGENOUS CELLS monophialidic, determinate, subulate, cylindrical to sublageniform, smooth-walled, hyaline, 5-11 x 1.5-2 μm with periclinal thickening and shallow collarette. CONIDIA filiform to subobclavate, obtuse at the apex, sometimes guttulate, 0-septate, dry, smooth-walled, hyaline, 28-41 x 1.5-2 μm. Teleomorph unknown. Holotype: INIFAT C92/42-3 on dead leaves of *Nectandra coriacea* in undisturbed rainforest, San Antonio de los Baños, La Habana, Cuba. R.F. Castañeda, 2 February 1992, (MUCL 39873 isotype).

Not obtained in pure culture.

The conidia of the previously described species of ***Pseudomicrodochium*** Sutton (1975), such as ***P. aciculare*** Sutton (1975) (type species), ***P. cylindricum*** Sutton (1975), ***P. candidum*** (Bres.) de Hoog (1978), ***P. suttonii*** Ajello, Padhye & Payne (1980), ***P. lauri*** P.M. Kirk (1983), ***P. fusarioides*** Sutton & Campbell in Sutton *et al.* (1991), ***P. antillanum*** R. F. Castañeda & Kendrick (1991) and ***P. triseptatum*** Matsushima (1995), showed evident differences from ***P. nectandrae***, as highlighted in the key below.

KEY TO *PSEUDOMICRODOCHIUM* SPECIES

1a. Conidia colourless 2

1b. Conidia darkly pigmented 8

2a. Conidia non-septate 3

2b. Conidia septate 5

3a. Conidia cylindrical with rounded ends, one-celled, 10-16 x 2.0-2.5 μm, hyaline, smooth . . . . *P. lauri*

3b. Conidia not cylindrical 4

4a. Conidia 28-35 x 1.5-2.0 μm, filiform to subobclavate . . . . *P. nectandrae*

4b. Conidia 6-12 x 1.5-2.0 μm, obclavate . . . . *P. antillanum*

5a. Conidia 3-septate, 13-16 x 1.8-2.0 μm with end cells smaller than centrals cells, hyaline, smooth . . . . *P. candidum*

5b. Conidia 1-2-septate 6

6a. Conidia acicular, mostly 1 (rarely 2)-septate, hyaline, 21.5-31.5 x 1.0 μm, smooth . . . . *P. aciculare*

6b. Conidia cylindrical, fusiform or falcate 7

7a. Conidia 16-24 x 1.5-2.0 μm, cylindrical, slightly tapered and obtuse at the base, 1-septate . . . . *P. cylindricum*

7b. Conidia 11-20 x 2.0-2.5 μm, fusiform and falcate, truncate at the base, 1(-2)-septate, and guttulate . . . . *P. fusarioides*

8a.- Conidia 7.5-10.5 x 3-4 μm, oblong, 1-3-septate (mostly 3-septate); conidiogenous cells always monophialidic . . . . *P. triseptatum*

8b.- Conidia 18-30 x 1.0-1.2 μm, fusiform to falcate, 3-8-septate; conidiogenous cells mono- or polyphialidic . . . . *P. suttonii*

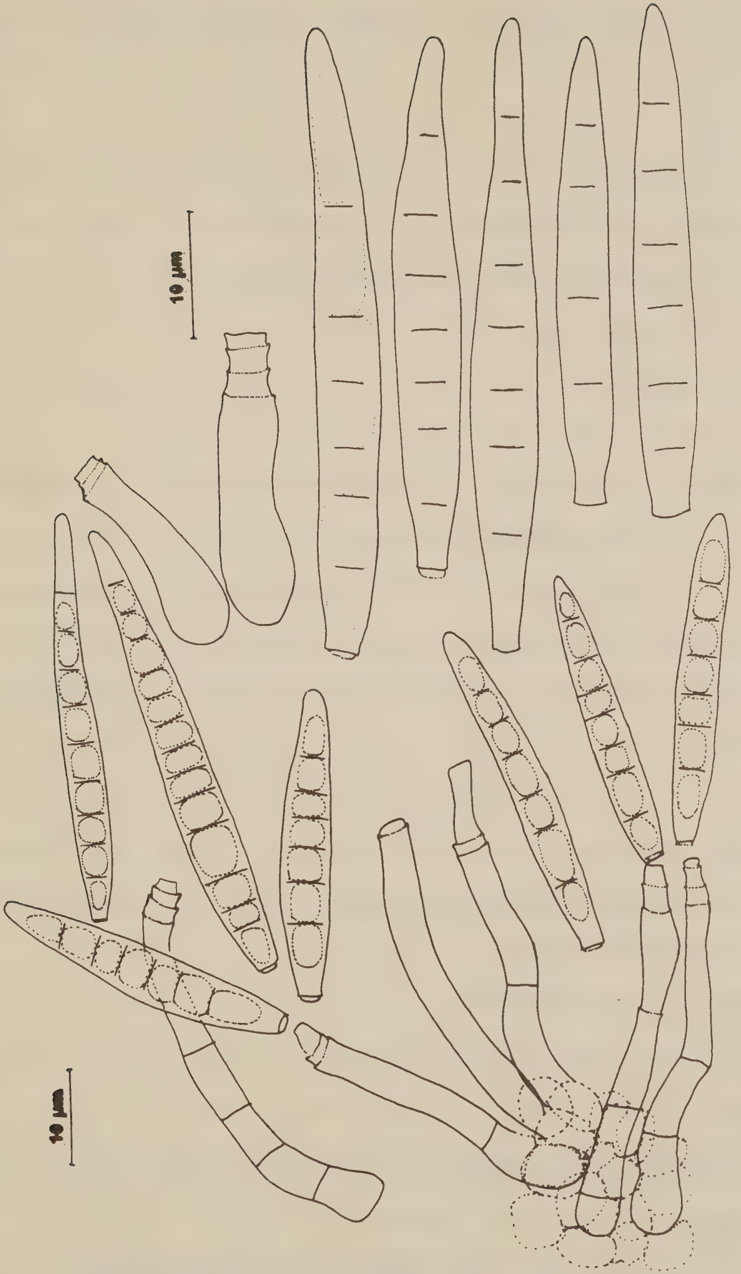


Fig. 3.- ***Refractohilum mycophilum*** (INIFAT C91/229)

Refractohilum mycophilum R. F. Castañeda, W.B. Kendrick et Guarro, *anam. sp. nov.*

(Figs. 2 f-j, 3)

Ad fungos conidiales, hyphomycetes pertinens. COLONIAE mycophilae, effusae, albae. Mycelium partim superficiale et partim in substrato immersum, ex hyphis septatis, ramosis, laevibus, hyalinis, 2-4 μm diam. compositum. STROMATA rudimentalia, ex cellulae globosae vel subglobosae, hyalinae, 4.5-6.5 μm diam. composita. CONIDIOPHORA conspicua, mononematosa, erecta, flexuosa, 0-3 septata, subobclavata, eramosa, 30-55 μm alta et 4-5 μm ad basim, hyalina, levia. CELLULAE CONIDIOGENAE monoblasticae, annellatae, per usque ad 6 proliferationibus percurrentibus formatae; terminales, integratae, hyalinae. CONIDIA solitaria, acrogena, obclavata, truncata ad basim, 3-13, plerumque 7- distoseptata, sicca, levia, hyalina, 30-55 x 4-6 μm, 2-3 μm crassa ad basim. Teleomorphosis ignota. Holotypus: INIFAT C91/229 in ascomata *Xylariae* Hill ex Grev. sp., in sylva pluvialis, Santiago de Las Vegas, La Habana, Cuba, leg. R.F. Castañeda, 19-XII-1991, (MUCL 39870 isotypus).

Conidial fungi, hyphomycetes. COLONIES mycophilous, effuse, white. Mycelium partly superficial and partly immersed. Hyphae septate, branched, smooth-walled, hyaline, 2-4 μm diam. STROMATA rudimentary, composed of globose to subglobose, hyaline, 4.5-6.5 μm diam. cells. CONIDIOPHORES differentiated, mononematous, erect, flexuous, 0-3 septate, subobclavate, unbranched, 30-55 μm tall and 4-5 μm wide at the base, hyaline, smooth-walled. CONIDIOGENOUS CELLS monoblastic, annellate, with up to 6 percurrent proliferations, terminal, integrated, hyaline. CONIDIA solitary, acrogenous, obclavate, obtuse at the apex, truncate at the base, 3-13 usually 7-distoseptate, dry, smooth-walled, hyaline, 30-55 x 4-6 μm, 2-3 μm wide at the base. Teleomorph unknown.

Colonies on oat meal extract agar at 25 ±1^0C reaching 22-30 mm diam. in 10 days, grey to cream-colored with some sparse pale brown zones, reverse cream-colored. Aerial mycelium almost absent, sporulating poorly (profuse sporulation has been observed on sterilized ascomata of *Xylaria cubensis* after two weeks).

Holotype: INIFAT C91/229, on ascomata of *Xylaria* Hill ex Grev. sp., in a rainforest, Santiago de las Vegas, La Habana, Cuba, col. R.F. Castañeda, 19 December 1991, (MUCL 39870 isotype).

Culture deposited: INIFAT C91/229.

Hawksworth (1977) introduced the genus ***Refractohilum*** with ***R. galligenum*** as type species and two additional lichenicolous species, ***R. achromaticum*** (Sutton) D. Hawksw. (1977) and ***R. peltigerae*** D. Hawksw. (1977); although ***R. achromaticum*** may grow also on wood or bark (Hawksworth, 1979; Mel'nik, 1993). Hawksworth (1979) keyed out the species of the genus ***Refractohilum***. This is characterized by its holoblastic, percurrent conidiogenous cells with several annellations and non-septate or septate, hyaline conidia. ***Refractohilum mycophilum*** is the only species of the genus with distoseptate conidia. Those of the other species are as follows: ***R. galligenum***, 8-14 x 4-6 μm and non-septate; ***R. peltigerae***, 15-20 x 6-9 μm and non-septate; and ***R. achromaticum*** 11-17 x 3-6 μm and 3-euseptate.

ACKNOWLEDGEMENTS

We are grateful to Dr. Enrique Descals (Inst. Mediterrani d'Estudis Avançats de les Illes Balears, C.S.I.C./U.I.B.) for serving as pre-submission reviewer. We acknowledge the Cuban Ministry of Agriculture for providing facilities.

REFERENCES

Ajello, L., Padhye, A. A. & Payne, M. (1980). Phaeohyphomycosis in a dog caused by *Pseudomicrodochium suttonii* sp. nov. *Mycotaxon* 12: 131-136.

Castañeda Ruiz, R.F. & Kendrick, W. (1991). Ninety-nine conidial fungi from Cuba and three from Canada. *Univ. Wat. Biol. Ser.* 35: 1-132.

Hawksworth, D.L. (1977). Three new genera of lichenicolous fungi. *Bot. J. Linn. Soc.* 75: 195-209.

Hawksworth, D.L. (1979). The lichenicolous hyphomycetes. *Bull. Br. Mus. Nat. Hist. (Bot.)* 6: 183-300.

Hoog, G.S. de (1978). Notes on some fungicolous hyphomycetes and their relatives. *Persoonia* 10: 33-81.

Kirk, P. M. (1983). New or interesting microfungi X. Hyphomycetes on *Laurus nobilis* leaf litter. *Mycotaxon* 18: 259-298.

Matsushima, T. (1995). Matsushima Mycological Memoirs 8: 1-54, Publ. T. Matsushima, Kobe.

Mel'nik, V.A. (1993). New to Russia hyphomycetes of the family Moniliaceae. *Mikologia i Fitopatologia* 27: 24-29.

Sutton, B.C. (1975). Hyphomycetes on cupules of *Castanea sativa*. *Trans. Br. Mycol. Soc.* 64: 405-426.

Sutton, B.C., Campbell, C.K. & Goldschmied-Reouven, A. (1991). *Pseudomicrodochium fusarioides* sp. nov. isolated from human bronchial fluid. *Mycopathologia* 114: 159-161.

MYCOTAXON

Volume LXVIII, pp. 33-40 July-September 1998

HYPHOMYCETES FROM CANADIAN STREAMS. IV. SPIROSPHAERA DIMORPHA SP. NOV.

Ludmila Marvanová

Czech Collection of Microorganisms, Tvrdého 14, 602 00 Brno, Czech Republic

and **Felix Bärlocher**

Department of Biology, Mount Allison University, Sackville, N.B., Canada

EOA 3CO

Abstract. A new species of *Spirosphaera* is described. It is similar to *Spirosphaera minuta*, but differs in having two morphologically different states: *Spirosphaera* state formed above water and *Lambdasporium* state formed below water.

Key words: hyphomycetes, aeroaquatic fungi, new species, stream foam.

Introduction

Spirosphaera dimorpha was obtained in spring in 1987 from softwater oligotrophic streams in SE New Brunswick and adjacent regions of Nova Scotia. It was isolated several times as monoconidial isolates of the *Lambdasporium* state from foam. Nuclei were stained with Giemsa after hydrolysis in HCl. Laccase and tyrosinase tests were performed according to Stalpers (1978).

Spirosphaera dimorpha Marvanová et Bärlocher, sp. nov. Figs. 1,3,5

Etym.: dimorphus (Gk.) = having two forms

Fungi anamorphici, hyphomycetes. Teleomorphosis ignota.

Coloniae albidae, lente crescentes, restrictae, delicate pubescentes, deinde farinaceae, odor pungens. Mycelium aerium delicatum, hyphae tenuitunicatae, cum excrescentionibus brevibus lateralibus numerosis.

Status *Spirosphaera* (Fig. 1). Conidiogenesis aeria. Conidiophora erecta, apicalia vel lateralia, singularia, simplicia, raro sub apice pauce ramosa, septata, nonnumquam absentia. Cellulae conidiogenae apicales vel intercalares, integratae, determinatae. Conidia singularia, apicalia vel lateralia, circumscriptione elipsoidea vel subrotunda, 15-40 x 12-32 µm, e ramis pseudodichotomis usque ad tertiariis, implexis, consistentia.

Status *Lambdasporium* (Fig. 3). Conidiogenesis subaquatica. Conidiophora simplicia, apicalia vel lateralia, nonnumquam absentia. Cellulae conidiogenae apicales, laterales vel intercalares, determinatae (?). Conidia apicalia, singularia, septata, matura triradiata, axis typice sigmoideus, 55-75 x 2.3-2.5 µm, apice subulatus, basi truncatus vel cum extensione basali excentrica vel percurrente, 5-29 µm longa; ramus solitarius, dorsalis,

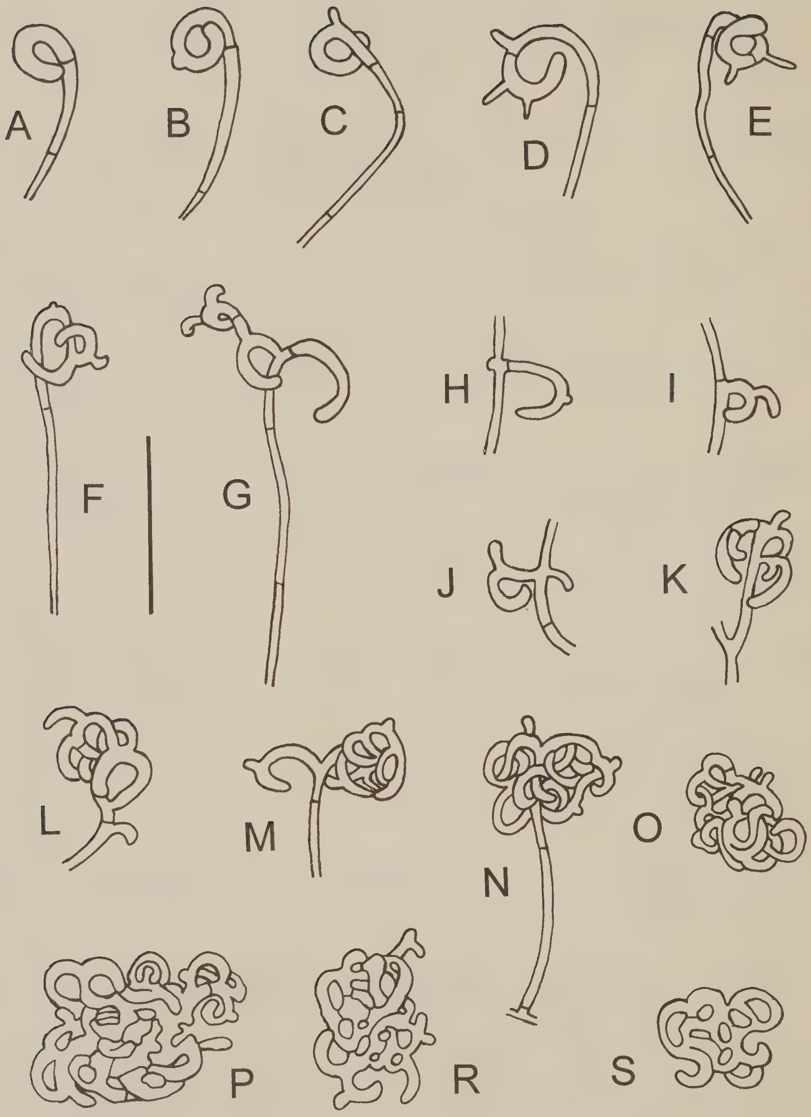


Fig. 1. *Spirosphaera dimorpha* CCM F-12587. *Spirosphaera* state. A-N. Conidial development. Note the absence of attenuation on the conidiogenous cell below the conidium. H-J. Intercalary conidial primordia. O-S. Conidia, optical section: middle level. Scale bar = 20 µm.

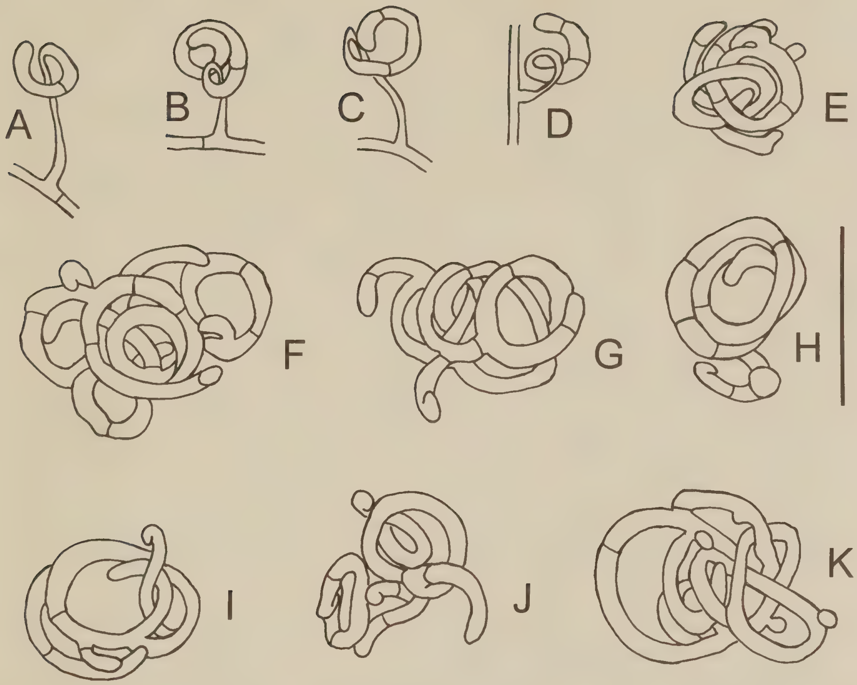


Fig. 2. *Spirosphaera minuta* Hennebert, holotype. A-D. Developing conidia. Note the conidiogenous cell attenuated below the conidal primordium. E-K. Conidia. Scale bar = 20 µm.

late divergens, sub media parte axis insertus, rectus vel ascendens, 25-38 x 1-2 µm, apice subulatus, basi non constrictus, nonnumquam abest.

Holotypus: **DAOM 223204**, ex CCM F-12587.

Anamorphic fungi, hyphomycetes. Teleomorph unknown.

Colonies whitish, slow-growing at 10°C, restricted, delicately downy, later mealy, odour pungent, especially when cutting the colony; laccase and tyrosinase tests with alpha-naphthol and para-cresol negative. Aerial mycelium delicate, hyphae thin-walled, with numerous short lateral pegs sometimes resembling clamps.

Spirosphaera state (Fig.1). Conidiogenesis aerial. Conidiophores apical or lateral, sometimes absent, single, simple, rarely sparsely branched near the apex, erect, septate, the septum below the conidium sometimes with a rudimentary clamp-like outgrowth. Conidia single, apical or lateral, air-trapping, more or less elipsoidal or subglobose in outline, 15-40 x 12-32 µm, composed of pseudodichotomous (one typically dominant) branches of up to third order, coiling often outwards and intermingled.

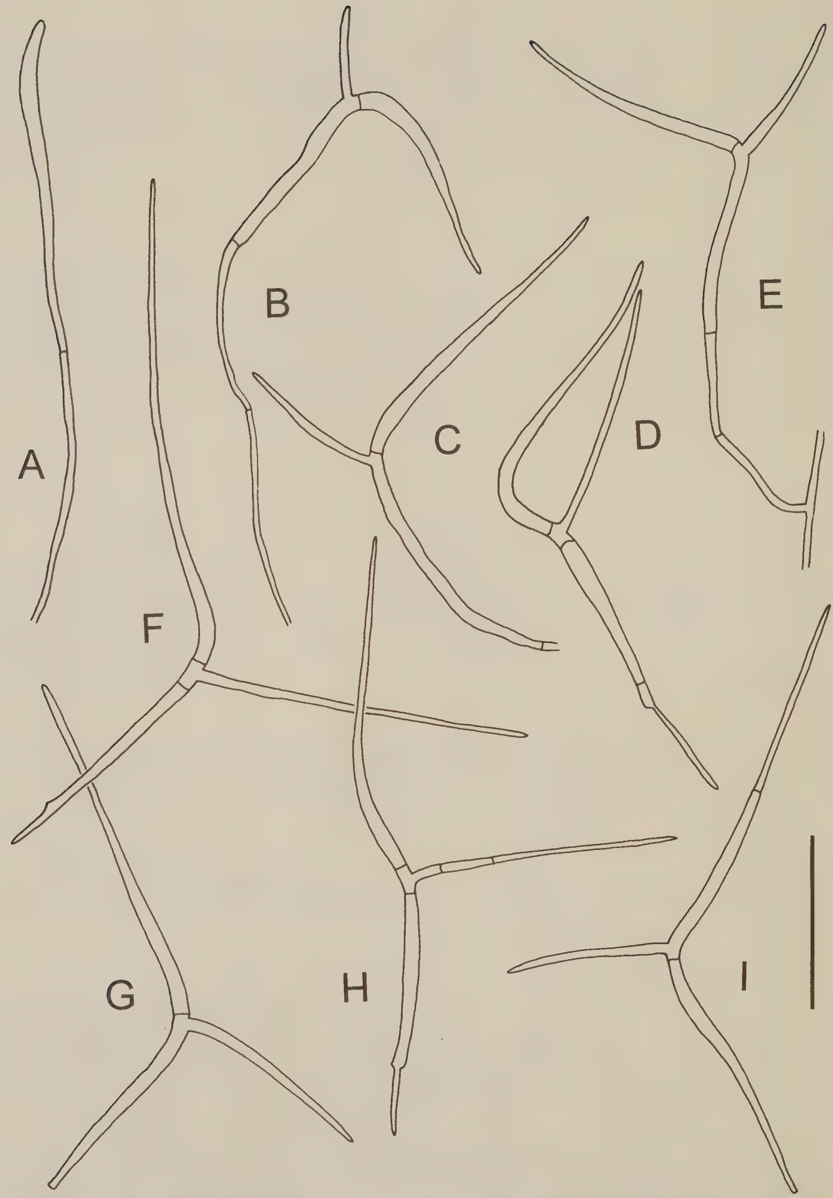


Fig. 3. *Spirosphaera dimorpha* CCM F-12587. *Lambdasporium* state. A-C, E. Conidial development. Note the absence of conidiophore proliferations. D, F-I. Conidia. Scale bar = 20 µm.

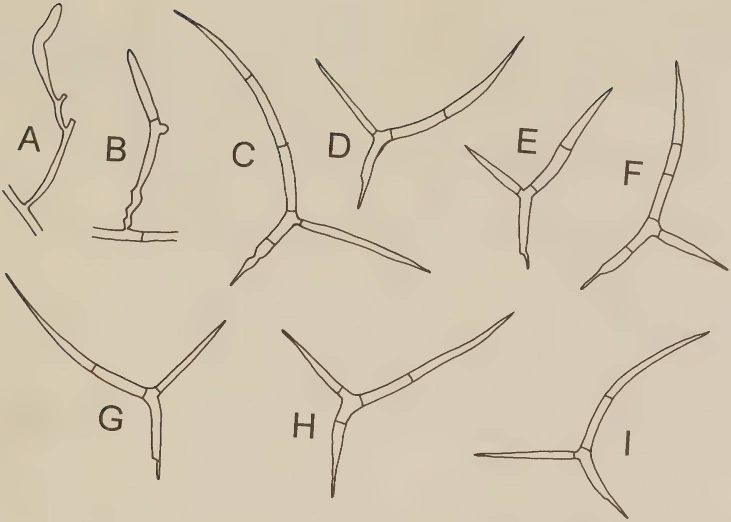


Fig. 4. *Lambdasporium viridense* Nawawi, holotype. A,B. Developing conidia Note the conidiophores with progressive elongations. C-I. Detached conidia. Scale bar = 20 µm.

Lambdasporium state (Fig.3). Conidiogenesis subaquatic. Conidiophores single, simple, apical or lateral and then short, sometimes absent. Conidiogenous cells apical, lateral or intercalary, proliferation after secession not seen. Conidia apical, single, triradiate when mature, septate, ends subulate, axis 55-75 x 2.3-2.5 µm, typically twice curved: first backwards (often at right angle) near the middle, then gradually onwards, base truncate after secession, later with an eccentric or rarely percurrent basal extension 5-29 µm long; branch single, 25-38 x 1-2 µm, sometimes lacking, dorsal, broadly diverging from the axis, originating below a septum near the middle or in the lower third of the axis, straight or ascending, insertion unconstricted.

This state appears under water and remains scanty in vitro; however, in some samples it was rather frequent. When germinating on the water level, these conidia produce the state *Spirosphaera* aerially on short erect conidiophores above water (Fig.5). This confirms the genetic connection of the *Spirosphaera* and *Lambdasporium* states.

Material examined:

Spirosphaera dimorpha: CCM F-12587, stream foam, Allen Creek, near Sackville, N.B., Canada, 13.4.1987, L. Marvanová and F. Bärlocher; CCM F-18687, stream foam, St. George Creek, N.S., Canada, 4.2.1987, L. Marvanová and F. Bärlocher; CCM F-21787, foam on slow flowing water in a roadside ditch, Rock Point, near Sackville, N.B. Canada, 23.4.1987, L. Marvanová. CCM F-13894, stream foam, at the crossing of Apple River and the Trans Canada Highway, near the village Apple River, Chignecto Bay, N. S., Canada, 1.10.1994, L. Marvanová . Both types of conidia were collected in stream foam. *Spirosphaera minuta*: GLH 8640, holotype, in MUCL, on *Betula alba* and *B. verrucosa* leaves in a ditch Hooge Vuursche, Baarn, prov.Utrecht,

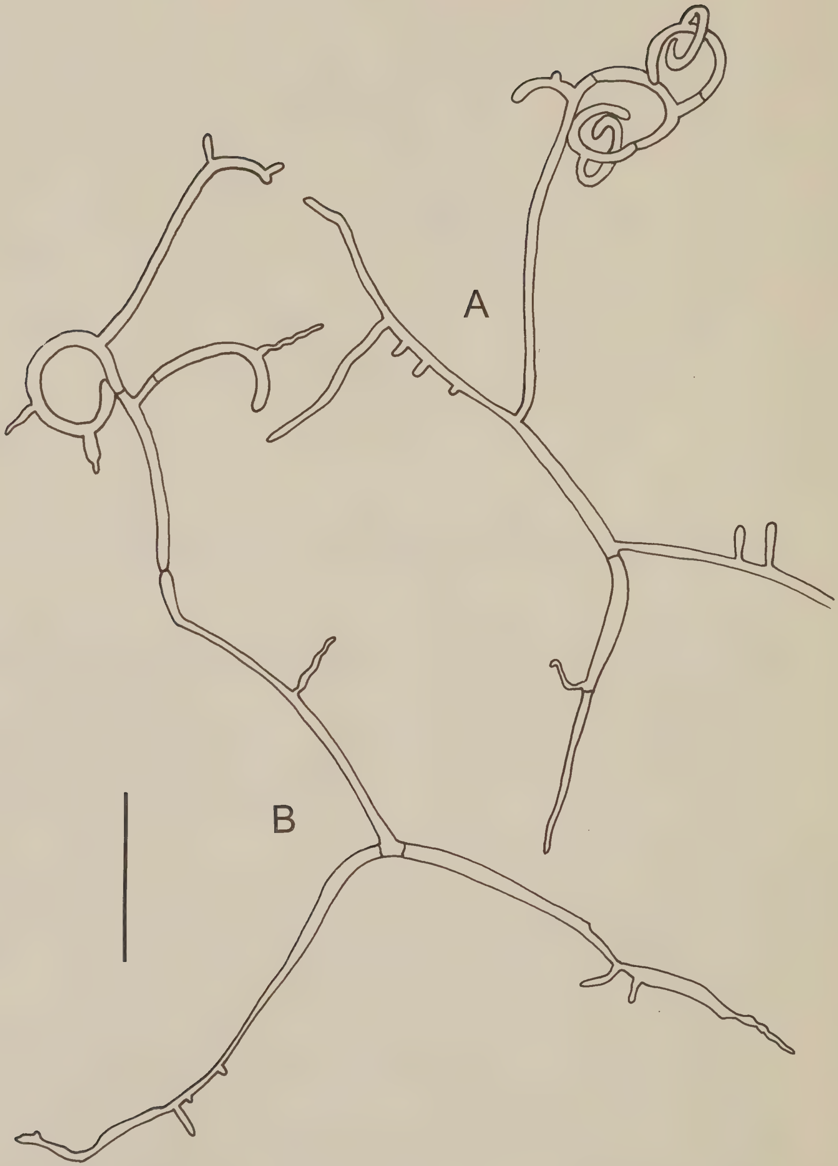


Fig. 5. *Spirosphaera dimorpha* CCM F-12587. A,B. *Lambdasporium* state conidia germinating on the water level and producing *Spirosphaera* state conidia. Scale bar = 20 µm.

Netherlands, 25.3.1966, G.L. Hennebert; CBS 475.66, (ex-type culture). *Lambdasporium viridense*: IMI 293443, holotype, from stream foam, the Cameron Highlands, Malaysia, May 1984, A. Nawawi; CCM F-11183, CCM F-12083, stream foam at Glassy Steps, River Teign, Dartmoor, Devon, U.K., Feb. 1983, L. Marvanová.

Both states of *Spirosphaera dimorpha* have conidia resembling those of already described conidial species: *Spirosphaera minuta* (Hennebert 1968) has propagules of similar shape, but the 'architecture' of the conidium is different (fig. 2) and the width of its conidial filaments is greater. The conidiogenous cell below the conidium is distinctly thinner. During the early stage of conidial development, the coiling thread is somewhat wavy, there is no frequent pseudodichotomous branching and no *Lambdasporium* state has been reported in the protologue or in subsequent collections (Abdullah et al. 1997). It was also absent in the CBS 475.66 culture of *Spirosphaera minuta* when examined in the Czech Collection of Microorganisms. Moreover, there are differences in the gross colony characters: *S. minuta* CBS 475.66 when grown under conditions similar to those of *S. dimorpha* (MA, 15^{O} C) produced an unrestricted whitish cottony colony with pale brownish mycelium in the centre. The colony of a recent Spanish isolate of *S minuta* is described as yellowish white to pale yellow, growing very slowly, reaching 2-3 mm diam. in two weeks at 15^{O} C, reverse pale to greyish orange. The propagules are typical of species (Abdullah et al. 1997, fig. 3). No odour with or without cutting the colony has been reported in either isolate of *S. minuta*.

Spirosphaera minuta is a rare species. After its description, it has only been isolated in the U.K. and Spain (Abdullah et al. 1997).

Lambdasporium viridense (Nawawi 1985) described from Malaysia but also isolated (Marvanová, unpubl.) and collected in foam (Dickson and Leonard 1996) in England, has conidia extremely similar to those of the *Lambdasporium* state of *Spirosphaera dimorpha*, but with elements roughly half as long (Fig.4). The conidiogenous cells in *L. viridense* elongate progressively during conidiation and the conidia have not been seen to produce *Spirosphaera* propagules when germinating on the water level. The colonies of *L. viridense* lack the pungent odour.and are strong producers of a dark green pigment released into the agar.

Single-branched conidia similar to those in the *Lambdasporium* state of *S. dimorpha* are known also in *Taeniospora gracilis* var. *enecta* Marvanová & Stalpers and were collected in some of the streams where *S. dimorpha* conidia occured (Marvanová & Bärlocher 1988, fig. 5, D-G). These differ clearly by having a clamp in the middle of the axis. In pure culture of a clampless isolate of presumably monocaryotic state of *Taeniospora descalsii* Marvanová & Stalpers we also observed single-branched conidia (Marvanová & Bärlocher 1988, fig. 6: J,L) similar to those of the *Lambdasporium* state , but the former were less than half the size of the latter.

Because of the odour resembling *Taeniospora gracilis* and the mycelial outgrowths similar to aborted clamps, we suspected that *Spirosphaera dimorpha* may be a monocaryotic version of a conidial basidiomycete. Attempts to mate isolates of *S. dimorpha* (CCM F- 12587, CCM F-18687, CCM F-21787) were carried out on malt agar. No reaction has been observed between any combination.

The natural substrate of *Spirosphaera dimorpha* is not known. The capacity of producing air-trapping almost unsinkable propagules for on-water dispersal as well as underwater conidia demonstrates the broad ecological potential of *Spirosphaera dimorpha.*

ACKNOWLEDGEMENT

The IMI and MUCL herbaria are thanked for having provided the type material, the Centraalbureau voor Schimmelcultures in Baarn, The Netherlands, for the ex-type culture of *Spirosphaera minuta.* L. Marvanová´s contribution to this paper is a part of the project GACR 206/98/0561. Financial support from the Natural Sciences and Engineering Research Council of Canada to FB is gratefully acknowledged. The first author expresses her gratitude to E. Descals and W.B. Fairbanks for having arranged the collecting trips to Dartmoor and Chignecto Bay, respectively.

REFERENCES

Abdullah, S.K., Guarro, J., Figueras, M.J. & Descals, E. (1997). Spanish hyphomycetes XVI. Some aeroaquatic conidial fungi. Mycotaxon 51: 311-318.

Dickson, G & Leonard, A. (eds.) (1996). Fungi in the New Forest. A Mycota. Hampshire Wildlife Trust, British Mycological Society, English Nature.

Hennebert, G.L. (1968). New species of *Spirosphaera.* Trans. Br. Mycol. Soc. 51: 13-24.

Marvanová, L. (1977). *Taeniospora gracilis* gen. et sp. nov. Trans. Br. Mycol. Soc. 69: 146-148.

Marvanová, L. & Bärlocher, F. (1988). Hyphomycetes from Canadian streams. I. Basidiomycetous anamorphs. Mycotaxon 32: 339-351.

Nawawi, A. (1985). Some interesting hyphomycetes from water. Mycotaxon 24: 217-226.

Stalpers, J.A. (1978). Identification of wood-inhabiting Aphyllophorales in pure culture. Stud. Mycol. 16, 248 pp.

MYCOTAXON

Volume LXVIII, pp. 41-46 July-September 1998

MELIOLA CHENNAIANA SP. NOV.
AND SOME ADDITIONAL RECORDS OF FUNGI FROM INDIA

R.D. Goos
Department of Biological Sciences
University of Rhode Island
10 Ranger Road
Kingston, RI 02881
USA

V.B. Hosagoudar
Microbiology Division
Tropical Botanic Garden and Research Institute
Palode 695 562, Thiruvananthapuram, Kerala, India

Abstract

This paper describes *Meliola chennaiana sp. nov.* and reports additional collections of *Agaricostilbum pulcherrimum*, the *Isthmospora* anamorph of *Trichothyrium asterophorum* (*Isthmospora spinosa*), *Meliola weberae*, and *Spiropes dorycarpus* from India. Distribution of the latter four species within India is briefly discussed.

Key Words: records of fungi, India, *Agaricostilbum, Isthmospora, Meliola chennaiana sp. nov., M. weberae, Spiropes dorycarpus.*

The fungi of India have been documented in several comprehensive publications (Bilgrami, Jamaluddin & Rizwi, 1979; Hosagoudar, 1996; Hosagoudar *et al.* 1996, 1997; Sarbhoy, Girdhari Lal & Varshney, 1975; Sarbhoy, Varshney & Agarwal, 1980; Subramanian, 1971) as well as in numerous journal articles. This paper reports on five species collected in India by the senior author during a visit in 1981. Specimens cited have been deposited in the herbarium of the New York Botanical Garden (NY) and in the herbarium of the Tropical Botanic Garden, Thiruvananthapuram (TBGT). One of the fungi reported is an undescribed species; others listed extend known distribution records within India.

1. *Agaricostilbum pulcherrimum* (Berk. & Broome) Brady, Sutton & Samson, Trans. Br. mycol. Soc. 83: 540. 1984.
=*Agaricostilbum palmicola* Wright, Mycologia 62: 680. 1970.

This fungus was collected on a palm spathe in Argentina by Wright (1970), who erected the genus *Agaricostilbum* and named the species, *A. palmicolum.* Subramanian and Natarajan (1975) collected a fungus on *Cocos nucifera* in India which they named *Amerobotryum indicum*; later *A. indicum* was reduced to synonomy with *A. palmicola* (Subramanian and Natarajan, 1977). Wright, Bandoni and Oberwinkler (1981) established that *A. palmicola* is an auricularioid basidiomycete, and presented a thorough morphological study, based on cultures. Brady *et al.* (1984), in a study of specimens maintained in the Herbaria of the Royal Botanic Gardens, Kew and in the Commonwealth Mycological Institute under the label *Isaria pulcherrima* Berk. & Broome, recognized that *I. pulcherrima* was identical to *A. palmicola.* As a consequence, they transferred *I. pulcherrima* to *Agaricostilbum*, retaining the specific epithet because of nomenclatural priority. These authors gave a complete nomenclator of the fungus and cite an extensive list of specimens examined. Based on their report, the known distribution of the *A. pulcherrima* includes Argentina, Australia, India, Pakistan, Sri Lanka (Ceylon) and Zambia. Most collections of the fungus have been on palms, but it has also been found on *Pandanus* and on dead bark and wood (Brady *et al.* 1984).

The three specimens cited here agree well with the published descriptions of the fungus and extend the known range of the fungus within India. Subramanian and Natarajan's (1975) specimen was collected near Madras (Tamil Nadu). Brady *et al.* (1984) cite additional Indian collections from the states of Bihar (Patna) and Uttar Pradesh (Faizabad, Varanasi). The specimens cited in this paper were all collected at Trivandrum in the state of Kerala.

Specimens examined: India. Kerala. Trivandrum. On palm litter, grounds of the Mascot Hotel, Goos No. 0392, June 5, 1981. On palm stem, Botanic Garden, Goos No. 0411, June 4, 1981. On palm litter, grounds of the Mascot Hotel, Goos 0426, June 5, 1981. Specimens deposited in NY.

2. *Isthmospora* anamorph of *Trichothyrium asterophorum* (Berk. & Broome) Höhnel. Sber. Akad. Wiss. Wien, 118: 1482, 1909.
=*Isthmospora spinosa* F. L. Stevens. Bot. Gaz. 66: 244. 1918.

This fungus is widespread and common in tropical regions as a parasite of meliolaceous fungi (Ellis, 1971). Subramanian (1971) recorded *I. trichophila* (Atk.) Damon as a parasite of *Meliola salaciae* in Mysore. Hughes (1953) cites a record of *Trichochyrium asterophorum* from India.

Specimens examined: India. Tamil Nadu. Chennai. Parasitizing *Meliola tenella* Pat. var. *atalantiae* (Pat.) Hansf. on *Atalantia monophylla.* Parasitizing

Meliola sp. on undetermined host. Campus of Madras Christian College, May 12, 1981. Specimens deposited in NY & TBGT.

3. ***Meliola chennaiana*** Hosagoudar & Goos, *sp. nov.* (Fig. 1)

Coloniae epiphyllae, densae, crustosae, ad 2 mm diam., raro confluentes. Hyphae rectae, plerumque opposite acuteque ramosae, laxe vel valde arte reticulatae, cellulae 16-21 x 6-8 μm. Hyphopodia alternata, antrorsa, recta, 17-23 μm longa; cellula basali cylindracea vel cuneata, 8-9.5 μm longa; cellula apicali ovata, oblonga, raro globosa, integra vel angularia, raro leniter lobata, 9-13 x 9-14.5 μm. Phialides producentes in hyphae distinctis, alternata vel opposita, conoidea vel ampullacea, 12-19 x 6-7 μm. Setae myceliales numerosae, simplices, rectae, acutae vel obtusae ad apicem, ad 540 μm longae. Perithecia dispersa vel laxe aggregata, immatura; ascosporae oblongae vel cylindraceae, 4-septatae, constrictae 36-42 x 16-17.5 μm.

Etymology: Named for the city of Chennai, the present name of Madras.

Colonies epiphyllous, dense, crustose, up to 2 mm in diameter, rarely confluent. Hyphae straight, branching mostly opposite at acute angles, loosely reticulate, cells 16-21 x 6-8 μm. Hyphopodia alternate, antrorse, straight, 17-23 μm long; stalk cells cylindrical to cuneate, 8-9.5 μm long; head cells ovate, oblong, rarely globose, entire to angular, rarely slightly lobate, 9-13 x 9-14.5 μm. Phialides borne on separate mycelial branch, alternate to opposite, conoid to ampulliform, 12-19 x 6-7 μm. Mycelial setae numerous, simple, straight, acute to obtuse at the tip, up to 540 μm long. Perithecia scattered to loosely grouped, immature; ascospores oblong to cylindrical, 4-septate, constricted at the septa, 36-42 x 16-17.5 μm.

Specimens examined: India. Tamil Nadu. Chennai. On leaves of *Lophopetalum sp.* (Celastraceae), Campus of Madras Christian College, May 12, 1981. Coll. R.D. Goos. ***Holotype:*** TBGT (No. 152). Isotype: NY.

The new species is distinct from other *Meliola* species known on members of the family Celastraceae in having only alternate hyphopodia (Hansford, 1961; Hosagoudar, 1996; Hosagoudar *et al.* 1997).

Ascospores of this fungus germinated in water drops, as has been reported previously for other species (Goos, 1978).

4. ***Meliola weberae*** Kapoor. Indian Phytopathol. 20: 159. 1967.

The type of this species was found on leaves of *Chomelia asiatica* (Rubiaceae) at Bilikere, Karnataka, India, Sept. 19, 1903 by E.J. Butler (HCIO No. 1035) (Hosagoudar et al. 1997). Hosagoudar and Goos (1990) reported this species from Pamba, in the state of Kerala. The collection cited here extends the range of the fungus to Tamil Nadu.

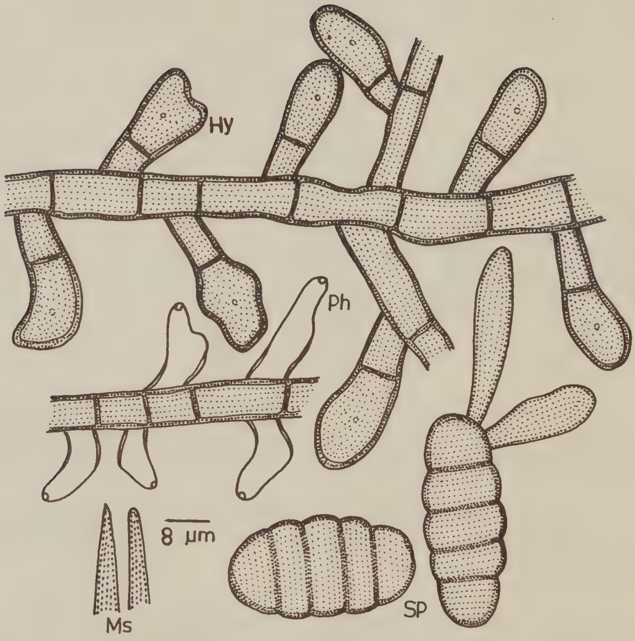

Hy
Ph
8 µm
Ms
SP

Fig. 1. *Meliola chennaiana sp. nov.* Key to abbreviations:
Hy = Hyphopodia. Ph = phialides. Ms = mycelial setae.
Sp = Ascospores.

Specimen examined: India. Tamil Nadu. Chennai. On leaves of *Chomelia asiatica* (Rubiaceae), Campus of Madras Christian College, 12 May, 1981. Coll. R.D. Goos. Deposited at TBGT (No. 180) and NY.

5. ***Spiropes dorycarpus*** (Mont.) M.B. Ellis. Mycol. Pap. 114:11-14, 1968.

This species is common and widely distributed in tropical regions (Ellis, 1971). Ellis includes India in the known distribution of this species, although Subramanian (1971) records only *S. guareicola* (Stev.) Cif. in his treatise. Bilgrami *et al.* (1979) list *S. helleri* (Stev.) M. B. Ellis (as *S. helberi*) in addition to *S. guareicola*.

Specimen examined: India: Tamil Nadu. Chennai. Campus of Madras Christian College, May 12, 1981, parasitizing *Meliola weberae* Kapoor, on leaves of *Chomelia asiatica* (Rubiaceae). Deposited in TGBT (No. 180) and NYBG.

Acknowledgments

RDG thanks the International Council for Exchange of Scholars for the award of an Indian-American Fellow which made the field aspects of this work possible. He also thanks Professor C.V. Subramanian for hosting his visit. Appreciation is also expressed to Professor B.P.R. Vittal and Dr. G. Sekar, who planned and accompanied him on numerous field forays, graciously extending assistance and many courtesies during his visit. We thank Dr. Amy Rossman for reviewing the manuscript and for many helpful suggestions. We also thank Dr. S.J. Hughes for reviewing the paper and for helpful comments.

References

Bilgrami, K.S., Jamaluddin and M.A. Rizwi. 1979. *Fungi of India*. Today and Tomorrow's Printers & Publishers. New Delhi. 467 pp.

Brady, B.L., B.C. Sutton and R.A. Samson. 1984. *Agaricostilbum pulcherrimum* (Berk. & Broome) comb. nov. Trans. Br. mycol. Soc. 83: 540-541.

Ellis, M.B. 1971. *Dematiaceous Hyphomycetes*. Commonwealth Mycological Institute, Kew. 608 pp.

Goos, R.D. 1978. Field and laboratory study of meliolaceous fungi in Hawaii. Mycologia 70: 995-1006.

Hansford, C.G. 1961. The Meliolineae. A Monograph. Sydowia Beih. 2: 1-806.

Hosagoudar, V.B. 1996. *Meliolales of India*. Botanical Survey of India, Calcutta. 363 pp.

Hosagoudar, V.B. and R.D. Goos. 1990. Meliolaceous fungi from the state of Kerala, India. II. The genus *Meliola*. Mycotaxon 37: 217-272.

Hosagoudar, V.B., T.K. Abraham and P. Pushpangadan. 1996. *Fungi of Kerala.* Tropical Botanic Garden, Thiruvananthapuram, Kerala. 151 pp.

Hosagoudar, V.B., T.K. Abraham and P. Pushpangadan. 1997. *The Meliolineae - A Supplement*. Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram, Kerala, India. 201 pp.

Hughes, S.J. 1953. *Fungi from the Gold Coast. II.* Mycological Paper No. 50. 104 pp. Commonwealth Mycological Institute, Kew.

Sarbhoy, A.K., Girdhari Lal, and J.L. Varshney. 1975. *Fungi of India, 1967-71*. Navayug Traders, New Delhi. 150 pp.

Sarbhoy, A.K., J.L. Varshney and D.K. Agarwal. 1980. *Fungi of India, 1971-76.* Navayug Traders, New Delhi. 277 pp.

Subramanian, C.V. 1971. *Hyphomycetes*. Indian Council of Agricultural Research, New Delhi. 930 pp.

Subramanian, C.V. and K. Natarajan. 1975. Two new Hyphomycetes from India. Mycologia 69: 1211-1217.

Subramanian, C.V. and K. Natarajan. 1977. On the genera *Agaricostilbum* and *Amerobotryum*. Mycologia 69: 1224-1226.

Wright, J.E. 1970. *Agaricostilbum*, a new genus of Deuteromycetes on palm spathes from Argentina. Mycologia 62: 679-682.

Wright, J.E., R. Bandoni and F. Oberwinkler. 1981. *Agaricostilbum*: an auricularioid basidiomycete. Mycologia 73: 880-886.

MYCOTAXON

Volume LXVIII, pp. 47-51 July-September 1998

DIPLOMITOPORUS DILUTABILIS A NEW SPECIES OF POLYPORACEAE (APHYLLOPHORALES) FROM SANTA CATARINA ISLAND, BRAZIL

CLARICE LOGUERCIO-LEITE
Laboratório de Micologia, Departamento de Botânica, Universidade Federal de Santa Catarina, 88090 400, Florianópolis, SC, Brazil

and

JORGE E. WRIGHT
Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, 1428, Buenos Aires, Argentina

ABSTRACT

Diplomitoporus dilutabilis is described as new and is characterized by a trimitic hyphal system, skeletal and binding hyphae dissolving in KOH, binding hyphae with a basal clamp always evident, and cylindrical to slightly allantoid spores; it grows on angiosperms, in a subtropical area.

KEY WORDS: new species, *Diplomitoporus*, Aphyllophorales.

INTRODUCTION

The genus *Diplomitoporus* was created by Domanski (1970) including species with a resupinate to effused reflexed, light-colored basidiocarp, pores round to angular, dimitic hyphal system with non-amyloid to weakly amyloid skeletal hyphae, cystidia absent or present, allantoid to ellipsoid, thin-walled, smooth and non-amyloid spores. On dead wood of conifers and hardwoods, and causing a white rot.

In addition, Ryvarden & Gilbertson (1993) included in *Diplomitoporus, Polyporus lindbladii* Berk. justified that " differs from the other species described here, by having a softer basidiocarp, a weak amyloid reaction in the skeletal hyphae which partly dissolve or become gelatinized in 3% KOH. Since the type of rot, the hyphal system and the spores are of the same length and type, we feel that the deviating characters mentioned above, do not justify a separate genus. *Poria lenis* Karst., which previosly was placed in this genus has been transfered to *Skeletocutis* as suggested by Niemelä because of the small lunate spores and the scattered crystals on the hyphae in the dissepiments."

MATERIAL AND METHODS

Basidiocarps were studied according to the methodology of Loguercio-Leite and Wright (1991). Colours are according to Munsell (1975) and abbreviations listed by Holmgren et al. (1990).

RESULTS

Diplomitoporus dilutabilis Loguercio-Leite & Wright *sp. nov.*

Basidiocarpus annuus, resupinatus vel effuso-reflexus, in vivo tenax, in sicco durus, rimosus, usque 2.0 mm crassus. Pileus niveus vel flavidus, margo mycelianus, angustus, sterilis. Hymenophorus niveus vel cremeus, poris angularis vel elongatus, 4-6 per mm, tubulis concoloribus usque 1.5 mm long; contextus tenuis, 0.3-0.5 mm crass., gossypinus, concoloribus.

Systema hypharum trimiticum, hyphis fibulatis in subiculo tenui-tunicatis, 2.0-2.5 μm diam., in contexto tramaque crassi-tunicatis, 2.5-4.5 μm diam.; hyphis skeletibus leviter amyloideis, crassi-tunicatis, 2.5-6.0 μm diam. in sol. KOH diffluentibus; hyphis colligantis 1.0-2.0 μm diam., crassi-tunicatis vel solidis, ud basis fibulatis, in angulo recto ramificatis in contexto tramaque, in tubulis emergentibus, amyloideis, in KOH diffluentibus. Cystidiis adsunt. Basidiis claviformibus, tenui-tunicatis, hyalinis, tetrasporis, fibulatis. Basidiosporis cylindricis vel leviter allantoideis, hyalinis, levibus, tenui-tunicatis, 4.5-5.5 x 2.5-3.0 μm, inamyloideis. Holotypus: Brasilia, Insula Santa Catarina, Florianópolis, Trindade, Campus Universitário, leg. Loguercio-Leite & Furlani 365, 24. I 1988 in Herb. FLOR 10693 conservatus est; isotypus in BAFC 34613.

Figure 1

Basidiocarps annual, resupinate to effused reflexed, tough when fresh, hard and cracking when dry, up to 2.0 mm thick. Upper surface white (8/2 10YR) to yellow (7/6 10YR), margin mycelial, narrow, sterile. Pore surface white (8/2 10YR) to cream (8/3 10YR), pores angular to radially elongated in some places, 4-6 per mm, tubes concolorous with hymenial surface, to 1.5 mm deep. Context thin, 0.3-0.5 mm, cottony, concolorous with tubes.

Hyphal system trimitic, hyphae clampled abundant, thin walled in subiculum, 2.0-2.5 μm diam., thick walled in trama and context, 2.5-4.5 μm diam; skeletal hyphae weakly amyloid in Melzer's reagent, when observed in mass, thick-walled, 2.5-6.0 μm diam., dissolving in phloxine + KOH, in phloxine, in 3% KOH solution and in Congo-Red + ammonia; binding hyphae, 1.0-2.0 μm diam, walls thick to solid, a basal clamp present, alternately branching at right angles, present in the in trama and context, projecting in to the tubes, amyloid in mass, dissolving as the skeletal hyphae. Rhomboid crystals present when dissolution occurs. Cystidia absent, fusoid cystidioles present, thin-walled, hyaline, 10.0-14.0 x 3.5-4.0 μm. Basidia clavate, thin-walled, hyaline, 4-sterigmate, with a basal clamp. Basidiospores cylindrical to slightly allantoid, hyaline, smooth, thin-walled, 4.5-5.5 x 2.5-3.0 μm, IKI-.

Holotype: BRAZIL, SC, Ilha de Santa Catarina, Trindade, Campus, UFSC, Loguercio-Leite and Furlani 365, 24/I/89 (FLOR 10693). **Isotype** in BAFC.
Material examinated: The holotype and BRASIL, SC, Florianópolis, Trindade, Campus, UFSC, Loguercio-Leite and Furlani 108, 28/I/88 (FLOR 10556); ibid, Costeira do Ribeirão, Sítio do Jambo, Gerber, Loguercio-Leite & Foresti, 634, 09/V/95 (FLOR 11169).

Substrata: Dicotyledones

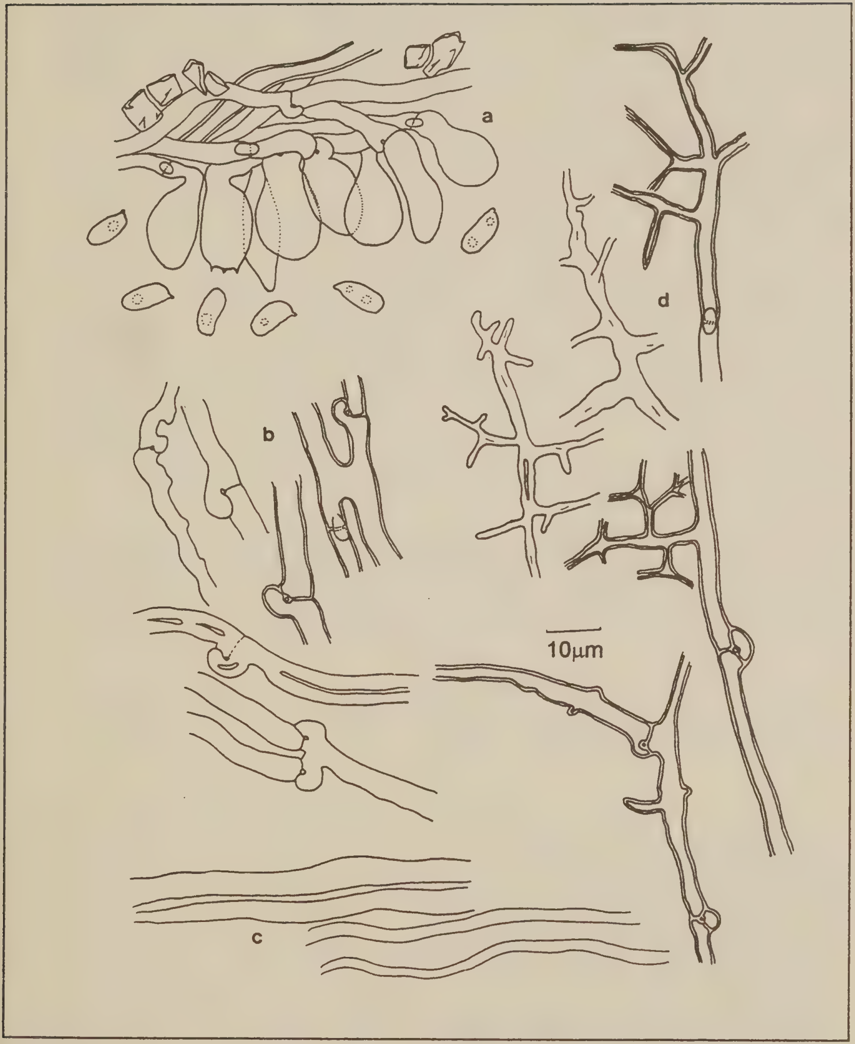


Fig.1. *Diplomitoporus dilutabilis* (FLOR 10693). a. hymenium: basidia, basidioles and spores; b. generative hyphae, thin- and thick-walled; c. skeletal hyphae; d. binding hyphae with a basal clamp.

Distribution: Only known from Santa Catarina Island, Brazil.

Remarks: There are other species which also exhibit dissolution of skeletal hyphae in KOH. We examined *Diplomitoporus lindbladii* (Berk.) Gilbn and Ryv. (=*P. cinerascens*, BAFC 30237, 27644, 27658) which appears to be the closest species, despite the controversial discussion about its hyphal system (Cunningham, 1947; Gilbertson, 1974; Gilbertson and Ryvarden, 1986). The last two authors stated that it is dimitic and placed it in *Diplomitoporus* (*D. lindbladii* = *Polyporus cinerascens* Bres.), however Ryvarden & Gilbertson (1993: 243-244) considered it trimitic. Jülich (1982) transfered *Polyporus lindbladii* Berkeley to a new genus *Cinereomyces*, based on the dissolution of the skeletal hyphae in 3% KOH, that is the only difference with *Trametes flavescens* Bres. (type species of *Diplomitoporus*) which lacks this feature. Species of other genera also exhibit dissolution of skeletal hyphae. Thus David and Rajchenberg (1992) proposed *Skeletokutis diluta* (Rakchenb.) David & Rajchenb., this species also has skeletal hyphae dissolving in KOH; they stated that another species viz., *S. papyracea* David also presents this feature. Upon examination of specimens of the latter species we verified that both species are quite different from *D. dilutabilis* in spore measurements and by *D. dilutabilis* having a trimitic hyphal system. We examined *S. diluta* (BAFC 28250, FLOR 11067) which has allantoid spores, 3.0-3.5 x 0.5-1.0 μm and 5-7 pores per mm; *S. papyracea* (BAFC 34608) has cylindric spores (4.0-5.0 x 1.0-2.0 μm), and 2-4 pores per mm.

The genus concept of neither *Diplomitoporus* nor *Cinereomyces* however correlates the feature of skeletal hyphae dissolving in KOH with the amyloid reaction in Melzer's reagent, which our new species does. Since our materials fit quite closely in the concept of *Diplomitoporus lindbladii* we have thought best to include our new species in the former genus.

Acknowledgments

The authors are deeply grateful to Dr. Mario Rajchenberg (CIEFAP, Argentina) for the exhaustive and invaluable criticism.

References

Cunningham, G. H. 1947. New Zealand Polyporaceae 1 -The genus *Poria*. **Plant Dis. Div. Bull. 72**: 1-43.

David, A. & M. Rajchenberg. 1992. West African Polypores: new species and combinations. **Mycotaxon, 45**: 131-148.

Domanski, S. 1970. Wood-inhabiting fungi of Bialowieza virgin forests in Poland. XIII. Two species of *Diplomitoporus* Doman., gen. nov. **Acta Soc. Bot. Pol. 39**: 191-207.

Gilbertson, R. L. 1974. **Fungi that decay Ponderosa Pine**. Tucson, Arizona. The University of Arizona Press. 197p.

Gilbertson, R. L. & L. Ryvarden. 1986. **North America Polypores**. Vol. I: 1-433. Oslo: Fungiflora.

Holmgren, P. K., N. H. Holmgren and L. C. Barnett. 1990. Index Herbariorum. Pt. 1. The Herbaria of the World. International Association for Plant taxonomy, New York Botanical Garden, NY. 693p.

Jülich, W. 1982. Higher taxa of Basidiomycetes. **Bibliotheca mycol, 85**: 396.

Loguercio-Leite, C. & J. E. Wright, 1991. Contribution to a biogeographical study of the austro-american polypores (Aphyllophorales) from Santa Catarina Island, SC, Brazil. **Mycotaxon, 41** (1): 161-166.

Munsell, L. 1975. Munsell soil color charts. **U. S. Dep. Agric. Handb. 18** - Soil Survey Chart.

Ryvarden, L. & R. L.Gilbertson, 1993. **European Polypores**. Vol I: 1-387. Oslo: Fungiflora.

MYCOTAXON

Volume LXVIII, pp. 53-74 July-September 1998

ULTRASTRUCTURE DES ASQUES ET DES ASCOSPORES DE DESMAZIERELLA ACICOLA (SARCOSCYPHACEAE, PEZIZALES, ASCOMYCETES). INTERET SYSTEMATIQUE ET BIOLOGIQUE.

Leda M. **MELENDEZ-HOWELL**

CNRS. Laboratoire de Cryptogamie du Muséum National d'Histoire Naturelle.
12, rue de Buffon. 75005 Paris. France.

Alain **COUTE**
Gérard **MASCARELL**

Laboratoire de Cryptogamie du Muséum National d'Histoire Naturelle.
12, rue de Buffon. 75005 Paris. France.
et
André **BELLEMERE**

Attaché au Laboratoire de Cryptogamie du M.N.H.N.
Professeur honoraire à l'ENS de St. Cloud-Lyon.
53 Jardins Boieldieu. 92800 Puteaux. France.

ABSTRACT

TEM studies reveal that the asci of *Desmazierella acicola*, type species of the genus, are of the *Sarcoscypha* type, the ascospores being also very similar to those of this genus. So, in spite of a rather dark apothecial aspect the genus *Desmazierella* has to be included in the *Sarcoscyphaceae* and not in the *Sarcosomataceae*. Biological adaptations in apothecia (stiff hairs and strongly differenciated paraphyses observed with SEM) indicate that the genus *Desmazierella* results from a long evolution, as some other genera in the *Sarcoscyphaceae*. The structural construction of the ascus of *Desmazierella* is like that of the rest of the *Sarcoscyphaceae*, and unlike that of the *Sarcosomataceae*. The interest of this criterium in systematics is mentionned .

RESUME

Des études en microscopie électronique par transmission, montrent que les asques de *Desmazierella acicola* (espèce type du genre) sont de type *Sarcoscypha*, et que les ascospores sont aussi similaires à celles de ce genre. Malgré l'aspect sombre des apothécies, le genre *Desmazierella* doit donc être rangé dans la famille des *Sarcoscyphaceae s.s.* et non dans celle des *Sarcosomataceae.* Les adaptations biologiques des apothécies observées au microscope à balayage (soies et paraphyses bien différenciées) indiquent que le genre *Desmazierella,* comme d'autres *Sarcoscyphaceae,* résulte d'une longue évolution. Le type structural de l'asque de *Desmazierella* est le même que celui des autres *Sarcoscyphaceae* et diffère de celui des *Sarcosomataceae.*
L'intérêt de ce critère pour la systématique est indiqué.

INTRODUCTION

En raison du caractère remarquable de ses apothécies, entièrement hérissées de soies rigides, une pézize brune trouvée dans l'Ardenne belge près de Malmédy, par Marie-Anne LIBERT, a été placée par cet auteur, en 1829, dans le genre nouveau *Desmazierella*. Cette pézize, *D. acicola*, est habituellement rencontrée au début du printemps sur aiguilles mortes de pin en Europe où elle est largement distribuée. Une autre espèce d'aspect voisin, *D. piceicola* a été trouvée par la suite, en Finlande, sur aiguilles de sapin, en automne; ses asques n'ont que quatre ascospores (HUHTINEN et MAKINEN 1984). Le genre, qui n'a jamais été mis en synonymie, a d'abord été placé dans les discomycètes à apothécies velue (PHILLIPS 1887), SACCARDO 1889, MASSEE 1895, SVRCEK 1948) et, plus tard, dans les discomycètes operculés, chez les *Pezizaceae* (BOUDIER, 1905-1910, 1907). A la suite des travaux de CHADEFAUD (1946) et de LE GAL (1946 a et b), relatifs aux particularités de l'appareil apical des asques des *Sarcoscypha* et des genres apparentés, NANNFELDT (1949), approuvé plus tard par LE GAL (1953), a proposé de transférer le genre *Desmazierella* dans la famille des *Sarcoscypha*ceae (*sensu* LE GAL, 1946b, 1947, *nomen nudum*). En raison de l'absence de couleur vive de l'apothécie et de la présence de poils brun-noirâtres, ce genre a été placé dans la tribu des Urnulae. Celle-ci a été ensuite élevée au rang de famille sous le nom de *Sarcosomataceae (KOBAYASHI 1937). Le genre Desmazierella*, aux apothécies d'aspect sombre, a été inclus dans cette dernière, mais avec quelque doute (KORF 1970, 1973). Plus tard, les *Sarcoscyphaceae* (validées par ECKBLAD, 1968) et les *Sarcosomataceae* ont été fusionnées dans une même famille (ERIKSSON 1984: 6-7) appelée *Sarcosomataceae (s.l.)* pour des raisons d'antériorité. Cependant, divers travaux (KORF 1970, 1972; SAMUELSON et *al.*1980; DONADINI 1987; CABELLO 1988; DONADINI et *al.*1989; MELENDEZ-HOWELL et *al.* 1990; BELLEMERE et *al.*1990, 1994b; van BRUMMELEN 1994) ont montré que les *Sarcoscyphaceae* devaient être distinguées des *Sarcosomataceae s.s.* non pas par la couleur claire de leur apothécie, mais en raison d'une différenciation de la paroi apicale de leurs asques plus importante. Néanmoins le genre *Desmazierella*, dont les apothécies sont sombres, a été maintenu dans les *Sarcosomataceae s.s.* (ERIKSSON et HAWKSWORTH 1993), bien que ses affinités avec le genre *Sarcoscypha* aient été relevées par divers auteurs (MERKUS 1976, van BRUMMELEN 1978, HUHTINEN et MAKINEN 1984). Par ailleurs il a été observé qu'au moins un genre de *Sarcosomataceae*, à apothécies sombres, avait en fait, des asques d'un type proche de celui des *Sarcoscypha* (*Chorioactis*, BELLEMERE et *al.*1994b) et devait être placé dans les *Sarcoscyphaceae*. Ce pourrait être éventuellement le cas du genre *Desmazierella* . C'est pourquoi l'objet du présent travail est d'abord de déterminer, par des études en microscopie électronique, si les asques de ce genre sont du type des *Sarcoscypha*ceae ou du type des *Sarcosomataceae*. Quelques données complémentaires, relatives à la biologie de l'hyménium et de l'ascome, ont pu être apportées.

MATERIEL ET METHODES

Les échantillons de *Desmazierella acicola* étudiés sont les suivants :
Desmazierella acicola Lib.- Département de l'Ain, avril 1904. M. Clerc *leg*. E. Boudier, Herb. PC. Muséum National d'Histoire Naturelle, Paris.

Desmazierella acicola Lib.- Chessy (Saône et Loire), avril 1903. Abbé Lorton leg. E. Boudier, Herb. PC. Muséum National d'Histoire Naturelle, Paris.
Desmazierella acicola Lib.- Auf faulenden Nadeln von *Pinus silvestris* L. Prov. Brandenburg: Triglitz in der Prignitz. 2. IV. 1904. Otto Jaap *leg*. Otto Jaap, *Fungi selecti exsiccati*, Herb. PC. Muséum National d'Histoire Naturelle, Paris

Le matériel a été fixé selon les techniques classiques en microscopie électronique à transmission (MET) (BELLEMERE 1977), après réhydratation ménagée durant 24 heures entre des feuilles de papier filtre maintenues humectées d'eau. Les ultracoupes ont été contrastées par la technique de Thiéry. Une partie du matériel a, de plus, été étudiée au microscope électronique à balayage (MEB).

RESULTATS

Seuls des asques subadultes ont pu être observés en microscopie électronique à transmission.

1 – L'ASQUE SUBADULTE

a – Structure de la paroi latérale de l'asque (Fig. 1A, 1B, 3A, 3B).
A la base de la partie moyenne de l'asque (Fig. 1A, 3A), la paroi, peu réactive, est recouverte d'un mince gélin externe très sombre (interprété comme étant a-g, *sensu* BELLEMERE 1994a). Elle comporte deux parties qui ne sont pas limitées de façon bien tranchée : une partie externe, claire, assez mince et une partie profonde plus réactive. La partie externe, de texture irrégulière (avec des masses globuleuses claires) est interprétée comme c1; b, très mince, n'a pas été observée. La partie interne correspond à c3 (c2 n'étant guère distincte). La base de c3 est sous-tendue par un liseré très réactif et très mince constitué par le plasmalemme, peut-être recouvert d'une couche d très réduite.

A la partie supérieure de la région moyenne de l'asque (Fig. 1B, 3B), la paroi est plus épaisse. Le gélin est moins réactif. Dans la partie externe de la paroi, de texture toujours plus ou moins globulaire, on distingue difficilement c2 au-dessous de c1. La partie profonde de la paroi (c3), bien réactive, paraît finement stratifiée. A la base de c3, un liseré sombre, très fin, surmonte une mince couche dont l'aspect est proche de celui de c3, mais dont la structure est un peu plus grossière : c'est la couche d. Celle-ci repose sur le plasmalemme, assez épais et très réactif.

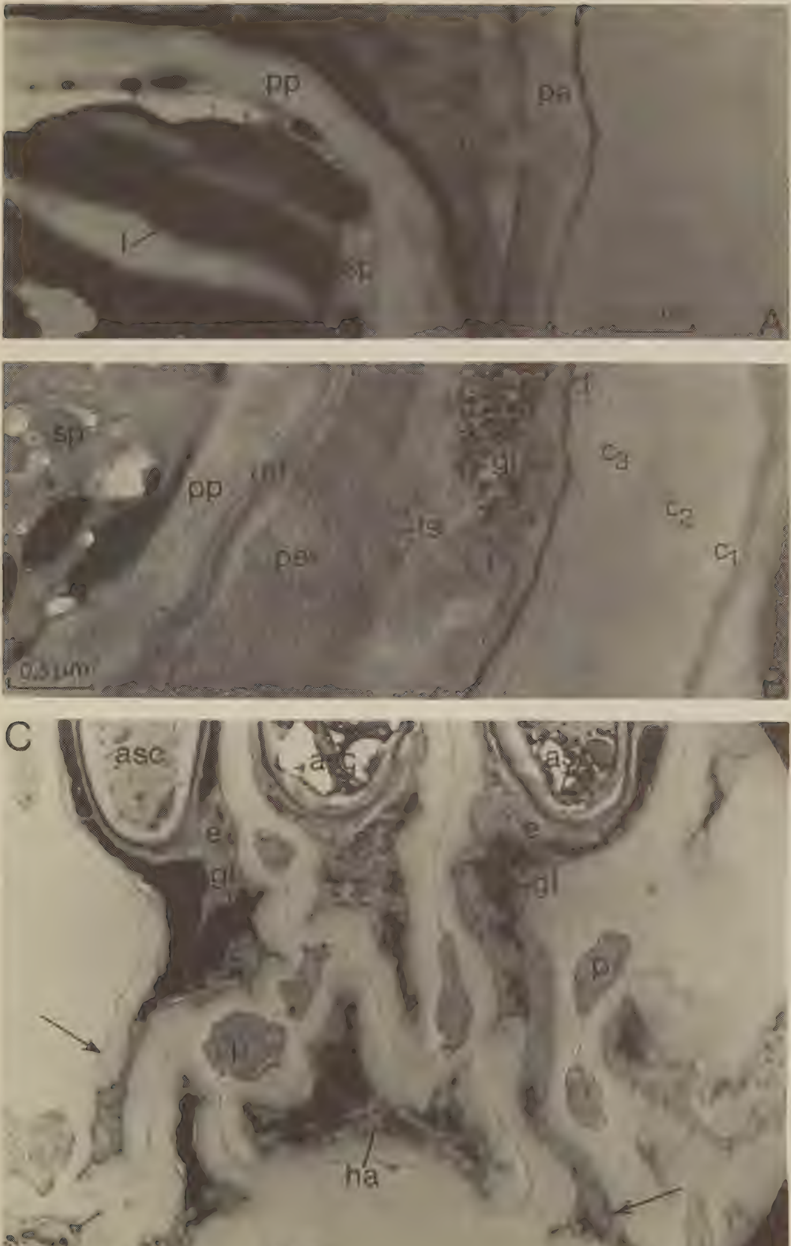
b – Structure de la paroi du sommet de l'asque (Fig. 2,3C, 5A).
Dans la région sous-apicale de l'asque, la couche c de la paroi s'épaissit, en particulier dans sa partie externe c1, à la base de laquelle c2 constitue une bande transparente au dessus de c3. Le gélin, devenu plus épais, a une texture globulaire. Il se différencie en deux strates d'épaisseur inégale dont la surface de contact est très irrégulière; la strate interne, plus mince et plus réactive, semble émettre de fréquentes expansions pédonculées dans la strate externe. Plus près de l'apex la couche d s'épaissit faiblement. Mais cependant la paroi devient un peu plus mince car l'épaisseur de la couche c, en particulier de c3, se réduit notablement, celle du gélin n'étant pas modifiée.

L'apex de l'asque, assez plan, est légèrement déprimé en son centre où l'épaisseur du gélin est à peine réduite. La couche c, un peu épaissie dans la région périaxiale est, au contraire, amincie au niveau de l'axe lui-même, en raison des variations d'épaisseur de c1. La couche d est considérablement épaissie au niveau de toute la partie déprimée du sommet de l'asque, où elle constitue une masse lenticulaire saillante dans le sommet de l'épiplasme. Cette masse, à valeur d'opercule, a une texture très nettement fibrilleuse. On y distingue, de façon claire, deux sous-couches: d1, externe et d2, interne. Elles sont séparées par une très mince lamelle transparente, soulignée, sur sa face interne, par une très fine couche réactive. Quand l'asque est presque mûr, la couche de gélin s'amincit dans sa partie axiale, la masse sommitale lenticulaire formée par d s'aplatit et la sous-couche d1, moins épaisse que d2, est plus mince. Vers la périphérie de cette masse sommitale, là où son épaisseur est minimale, on découvre difficilement une zone annulaire étroite, au niveau de laquelle la couche d perd sa réactivité. Cette zone est appelée communément zone de déhiscence chez les asques operculés. Ici elle est particulièrement étroite et elle se différencie tardivement, car elle est encore à peine perceptible lorsque les spores sont déjà à un stade avancé de maturation. A l'approche de la déhiscence, l'apex de l'asque est un peu rétréci et prend l'aspect d'un court cylindre, convexe à son sommet; la masse sommitale lenticulaire est alors plus aplatie et sa face inférieure est déprimée en son centre. La déhiscence n'a pas été observée au MET.

c - **Paroi de la base des asques et des hyphes ascogènes** (Fig. 1C, 3D)
La base des asques est un crochet nettement dissymétrique, souvent très allongé; sa paroi ne comporte pas de gélin; la couche a est très mince et réactive; la couche c est bien

---

Fig. 1. *Desmazierella acicola*. - Paroi latérale et paroi de la base des asques (MET, technique de Thiéry).
A - Coupe longitudinale dans la partie inférieure d'un asque presque mûr. La paroi de l'asque (pa), relativement mince, est formée essentiellement par la couche c; il n'y a pas de couche d. La paroi de l'ascospore comporte une paroi propre (pp) claire et différenciée, revêtue d'une périspore (per) bien réactive et d'épaisseur inégale. Une cape de petits globules lipidiques étroitement contigus revêt l'ascospore (ls). Une masse lipidique (l) importante est présente dans le sporoplasme (sp). **B** - Coupe longitudinale (peut-être un peu tangentielle) de la région sous-apicale d'un asque en maturation. Dans la paroi de l'asque, la couche c (c) est épaisse et une mince couche d(d) est distincte. Dans la paroi ascosporale, la paroi intermédiaire (int) est bien individualisée entre la paroi propre (pp), contiguë au sporoplasme (sp), et la périspore (per). Celle-ci est revêtue d'une couche continue de globules lipidiques (ls). Dans l'épiplasme (e), glycogène (gl) et lipides (l) sont présents. **C** - Coupe longitudinale de la base de quelques asques, avec ascospores (asc), au niveau de la partie supérieure du sous-hyménium. Les bases des asques, bien que relativement effilées (flèche), ont une paroi épaisse, ainsi que les hyphes ascogènes avoisinantes (ha). Par contre, les bases de paraphyses, dont on ne voit que de courtes sections (p), ont une paroi particulièrement mince. Le glycogène (gl) est abondant dans les hyphes ascogènes et l'épiplasme (e) des bases d'asques, mais il est absent des sections de paraphyses.


pp
pa
l
sp
A
sp
pp
int
pe
ts
gl
c3
c2
c1
0.5 µm
B
C
asc
asc
asc
e
gl
e
gl
p
l
ha
3µm

Dévelopée (avec c1 + c3 distinctes). Une mince couche d, très claire, semble présente. La paroi des hyphes ascogènes est épaisse, comme celle de la base des asques, mais celle des paraphyses environnantes est, au contraire, tout à fait mince.

d – Epiplasme

Dans l'épiplasme, le glycogène est abondant jusque vers l'extrême base de l'asque où il se présente en plages, ou en fins granules dispersés. Des lipides occupent toute la région périapicale de l'épiplasme au-dessus de l'ascospore supérieure. Au cours de la maturation de l'asque, ils paraissent s'accroître aux dépens de plages de glycogène.

2 – LES ASCOSPORES SUBADULTES (Fig. 1A, 1B, 4B).

Les ascospores unicellulaires, subcylindriques, à extrémités arrondies, sont très faiblement déprimées dans la région équatoriale (Fig. 4a). Leur surface est légèrement onduleuse. Leur paroi (terminologie de BELLEMERE 1994a) comporte trois parties superposées: une paroi propre assez épaisse et peu réactive, une mince paroi intermédiaire claire et une périspore, peu épaisse et réactive.

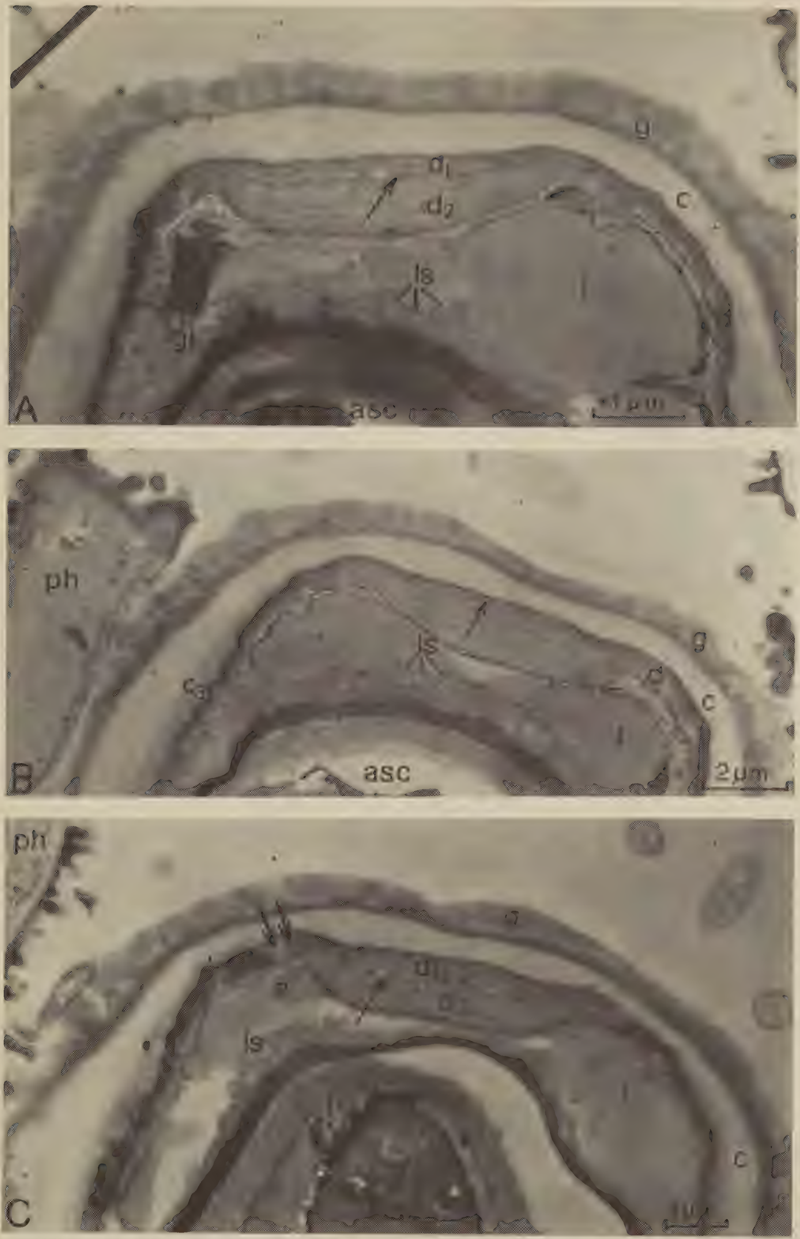
La paroi propre est différenciée en deux zones superposées. L'externe, mince, est dense et assez peu réactive. L'interne, homogène, claire, de texture finement granuleuse, est traversée par un chevelu lâche de minces fibrilles radiaires faiblement réactives.

La fine paroi intermédiaire, d'aspect clair, est bien individualisée. Elle contraste avec la réactivité de la périspore et avec celle de la zone externe de la paroi propre. Sa structure est difficile à analyser en raison de sa trop faible épaisseur. Elle semble séparée de la périspore par deux très minces lamelles parallèles réactives.

La périspore, relativement mince, bien réactive, est un conglomérat dense de granules réactifs et de petits globules plus clairs. Sa base est constituée par une très mince couche

---

Fig. 2. *Desmazierella acicola.* - Sommets d'asques (MET, technique de Thiéry).
A - Sommet d'asque. Le sommet de l'asque est recouvert d'un gélin (g) épais, assez réactif, de texture hétérogène. La couche c de la paroi (c), assez amincie dans la région sous-apicale, est un peu plus épaisse à l'apex sans cependant l'être autant que dans la paroi latérale. La couche d (d), assez réactive, s'épaissit d'abord progressivement vers le haut, puis brutalement au niveau de l'apex, où elle forme une masse operculaire, subdivisée en deux sous-couches d1 et d2 (flèche). Deux zones transversales non réactives, minces et étroites (pointes de flèches), délimitent latéralement l'opercule. Noter les petits globules lipidiques (ls) contigus autour de l'ascospore (asc) et, dans l'épiplasme, un gros globule lipidique (ls) et du glycogène (gl); à gauche, une paraphyse (ph). **B** - Sommet d'asque (un peu plus jeune que A) (mêmes légendes que A). La subdivision de d en d1 et d2 est à peine perceptible car d1 est très mince (flèche). A gauche la sous-couche c3 (c3), plus réactive que c1+c2, est bien distincte. **C** - Sommet d'asque (un peu plus âgé que **A**) (mêmes légendes que **A**). La sous-couche d1 a pris de l'importance. On ne distingue la limite claire de l'opercule que sur la gauche (double flèche).


g
d1
d2
c
ls
l
gl
A
asc
1 µm
ph
c3
ls
g
c
c
l
B
asc
2µm
ph
g
d1
d2
ls
l
c
C
1µ

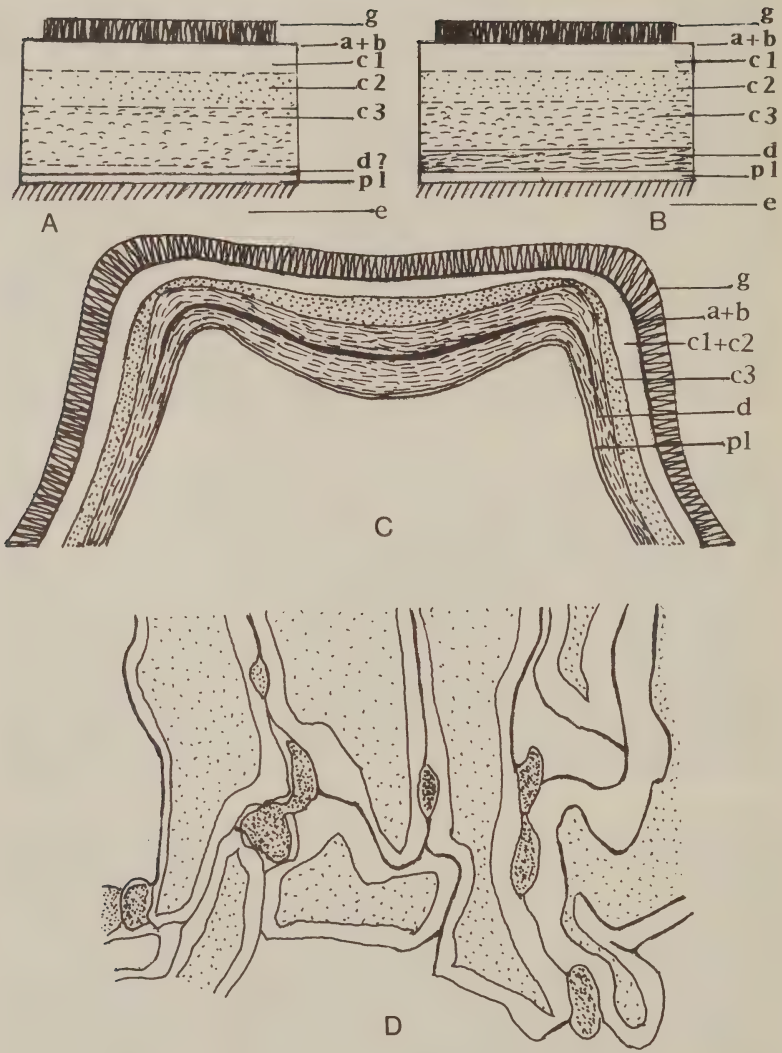


Fig.3. *Desmazierella acicola.* - Asque (schémas).
A - Coupe de la paroi de l'asque dans la partie inférieure de celui-ci. (a,b,c,d, couches de la paroi; g, gélin; pl, plasmalemme). **B** - Coupe de la paroi de l'asque dans la partie supérieure de celui-ci (mêmes légendes que **A**). **C** - Coupe de la partie apicale de l'asque (mêmes légendes que **A**; l, lipides; asc, ascospore). **D** - Base de l'hyménium (d'après la fig.1**C**). Alors que les hyphes ascogènes (ha) et les bases d'asque (ba) ont une paroi épaisse, les paraphyses (p) ont, au contraire, une paroi très mince.

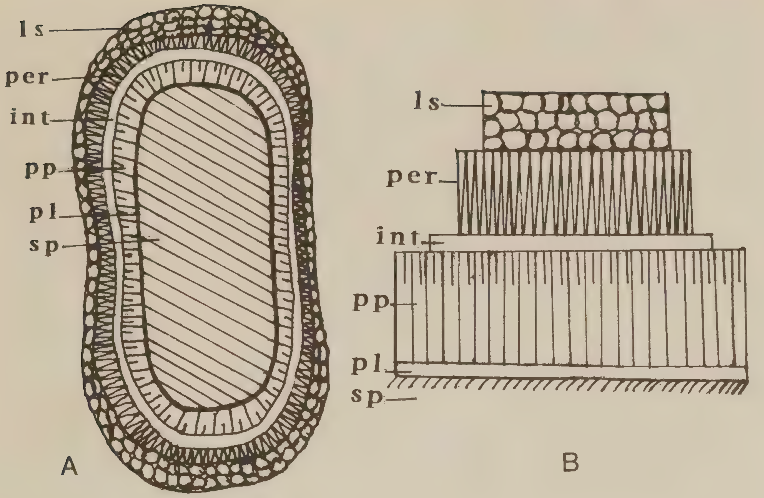


Fig. 4. *Desmazierella acicola.* - Ascopores.
A - Structure générale d'une ascospore en maturation (schéma). **B** - Coupe de la paroi d'une ascospore en maturation, près d'un pôle (schéma). (Légendes : int, paroi intermédiaire; ls, cape de globules lipidiques; per, périspore; pl, plasmalemme; pp, paroi propre; so, sporoplasme).

---

d'épaisseur irrégulière (Fig.1A) formée de vésicules aplaties, et qui est fragile, car à son niveau, des décollements se produisent fréquemment dans les coupes (Fig.1B). La limitante externe de la périspore n'a pu être observée.

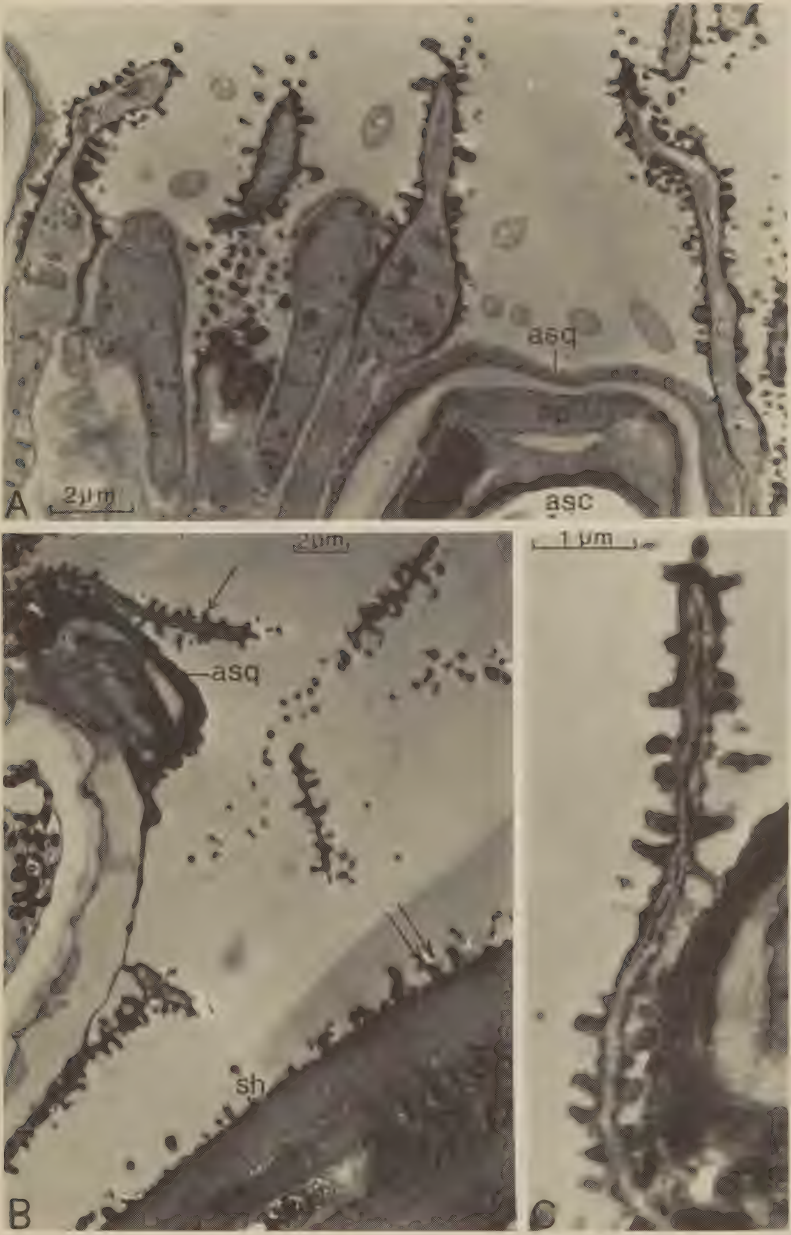
Les ascospores submûres sont coiffées, à chacun de leurs pôles, d'un amas relativement épais et assez étendu latéralement de petits globules lipidiques plus réactifs à leur périphérie. Ces globules prennent peut-être naissance dans la partie externe de la périspore, où l'on peut parfois en observer quelques-uns de petite taille. Certains des globules les plus externes, confluent avec de grandes plages lipidiques de l'épiplasme. Les ascospores plus jeunes sont revêtues latéralement, en dehors de leurs amas de globules polaires, d'une strate unique de globules lipidiques.

A maturité, le sporoplasme, dépourvu de glycogène, contient de gros globules lipidiques à contenu réactif, qui résultent de la confluence de globules plus petits.

3 – **LES PARAPHYSES** (Fig. 5A, 6A à D, 7B à D).

On sait que les paraphyses sont anastomosées dans leur partie inférieure et que leurs cellules sont plurinucléées (BERTHET 1964b). Ces paraphyses sont étroites à leur base où leur paroi, relativement mince, comporte deux couches : une couche interne claire, et une couche externe plus mince un peu réactive, dont la surface faiblement onduleuse est parfois recouverte d'un peu de gélin. Au-dessus du sommet des asques, les paraphyses sont renflées en ampoule, à base conique, dont le cytoplasme est dense. Cette ampoule sommitale qui est souvent partagée inégalement par une cloison plus ou moins transversale, est prolongée vers le haut par un filament pluricellulaire sinueux, assez épais, qui présente un léger étranglement, juste au-dessus de l'ampoule. La paroi externe de l'ampoule et de son prolongement filamenteux est très fortement réactive et couverte de courtes excroissances, également réactives. Ces excroissances, portées par la couche externe de la paroi de l'ampoule, ou du filament, ont une base assez étroite, d'aspect claviforme. Elles diffèrent dans le détail par leur forme et leur taille. Les excroissances superficielles de la partie supérieure des paraphyses, ne sont pas de simples dépôts externes. Ce sont des expansions de la partie externe de la paroi qui, semble-t-il, se forment initialement sous une très mince membrane non réactive, présente seulement au début de leur développement. Les excroissances ont d'abord un aspect tronconique surbaissé et paraissent s'allonger, par dépôt de strates successives, à partir de leur base. Elles finissent souvent, à la fin, par prendre une forme clavulée, parfois même plus ou moins pédonculée, indiquant que leur zone génératrice basilaire n'a pas tendance à s'étendre au cours de leur développement. Certaines paraphyses, bien que garnies d'excroissances dans leur partie supérieure (Fig.3B), sont apparemment dépourvues d'ampoule et donc entièrement filamenteuses. Leur sommet est plus mince et leur paroi est plus épaisse. Ce sont probablement des paraphyses sénescentes, dont le contenu cytoplasmique de l'ampoule s'est résorbé, ainsi que celui des cellules de leur partie terminale filamenteuse, à paroi fortement épaissie.

Fig. 5. *Desmazierella acicola.* - Paraphyses et soies hyméniales (MET, technique de Thiery).
A - Coupe verticale au niveau du sommet de l'hyménium. On distingue un sommet d'asque (asq), nettement déprimé, avec son opercule (op) et l'ascospore supérieure (asc). A gauche de l'asque, l'ampoule d'une paraphyse surplombe l'asque et se prolonge par un filament sommital, coupé obliquement. Ampoule et filament sont revêtus d'excroissances réactives alors que la partie inférieure de la paraphyse en est dépourvue. Plus à gauche, les bases des ampoules de deux paraphyses, non revêtues d'excroissances, sont coupées obliquement (l'une avec une cloison transversale). A l'extrême gauche comme à l'extrême droite, deux paraphyses sont coupées latéralement. **B** - Coupe longitudinale, latérale, d'un asque mûr (asq), proche de la déhiscence, et d'une partie d'une soie hyméniale (sh). Le sommet de l'asque a une section de forme caractéristique. La soie hyméniale a un diamètre important. Sa paroi pluristratifiée et épaisse est extérieurement recouverte d'excroissances (double flèche). **C** - Détail du sommet d'un mince filament terminal d'une paraphyse. La paroi du filament est importante, alors que la partie cytoplasmique, très réactive, a un très faible diamètre. La section des excroissances est généralement tronconique, avec éventuellement un renflement sommital.


asq
asc
A
2 µm
2 µm
asq
sh
B
1 µm
C

4 – **SOIES MARGINALES ET EXTERNES** (Fig. 5B, 6E, 7A à G).

Développées à la marge de l'apothécie et dans l'hyménium, les soies se distinguent des paraphyses, par leur caractère massif (Fig.3B en bas, à droite). Leur paroi interne, stratifiée, est beaucoup plus épaisse que celle des paraphyses et plus fortement réactive. Leur paroi externe mince, analogue à celle de l'ampoule et de la partie terminale des paraphyses, porte le même type d'excroissances que ces dernières. Ces soies pluricellulaires, ont des cloisons très minces.

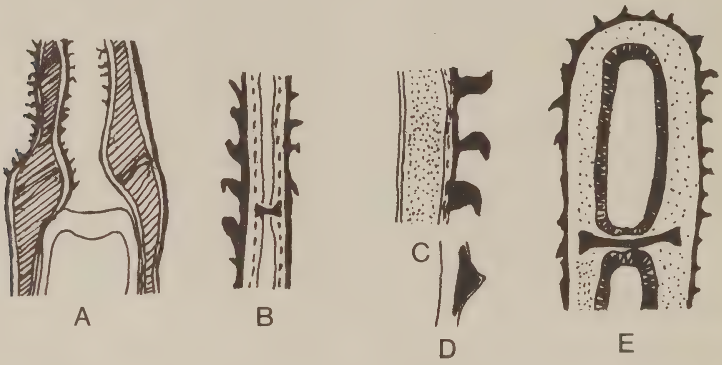


Fig. 6. *Desmazierella acicola*. - Paraphyses et soies (schémas).
A - Partie ampullaire de paraphyses et sommet d'asque, rapport topographique. **B** - Structure de la partie supérieure d'une paraphyse. **C** - Excroissances superficielles des paraphyses. **D** - Jeune excroissance. **E** - Structure d'une soie marginale.

DISCUSSION

La structure générale des ASQUES de *Desmazierella acicola* est celle du type *Sarcoscypha*, défini d'après l'étude fine des asques de *S. coccinea* (Van BRUMMELEN 1975 et 1978, SAMUELSON 1975, BELLEMERE 1977, DONADINI et *al.* 1989, MELENDEZ-HOWELL et *al.* 1990, BELLEMERE et *al.* 1990 et 1994b). Ce type est caractérisé, en particulier, par un fort épaississement de la paroi apicale de l'asque, dû à un important renforcement de la couche d, qui est réactive au test de Thiéry, et qui est nettement subdivisée en deux sous-couches d1 et d2. La couche c, par contre, est un peu amincie au sommet de l'asque. Les asques de type *Sarcoscypha*, diffèrent de ceux du type *Sarcosoma*. Chez ceux-ci la paroi est peu épaissie à l'apex, où la couche d est à peine plus importante et n'est pas subdivisée en deux sous-couches ; en outre, la couche c n'est pas amincie au sommet de l'asque.

Puisque ses asques sont de type *Sarcoscypha*, le genre *Desmazierella* doit donc être placé dans la famille des *Sarcoscyphaceae*, ainsi que l'avait déjà envisagé MERKUS (1976).

Dans cette famille, ce genre diffère d'un groupe de genres qui ont un opercule très épais et oblique (*Cookeina*, *Phillipsia* et genres affines : *Aurophora*, *Geodina*, *Microstoma*, *Nanoscypha*). Le genre *Desmazierella* diffère aussi du genre *Pithya*, à opercule plus mince et plus étendu. Il se distingue, également, des genres *Chorioactis* et *Pseudopithyella*, car la couche d de la paroi n'y est présente qu'au sommet des asques. On ne peut se prononcer sur les relations avec les autres genres de la famille (*Thindia*, *Pindara*) dont la structure fine des asques n'est pas connue. Parmi les *Sarcoscypha*ceae, c'est donc, en fin de compte, des asques de *Sarcoscypha* que ceux de *Desmazierella* se rapprochent le plus. Ils diffèrent cependant de ceux-ci par quelques particularités : apex jeune un peu déprimé, avec gélin épais et différencié; couche c de la paroi plus développée; base de l'asque à long et mince crochet dont la paroi est épaisse.

Le mode de déhiscence des asques de *Desmazierella acicola* n'a pu être observé dans ce travail. Il n'a été illustré que par BOUDIER (*Icones*, 1905-1910, N° 431, II, pl.363, h). L'amincissement que l'on constate, à l'approche de la déhiscence, dans la partie la plus axiale à l'apex de l'asque, aussi bien dans le gélin que dans la couche d, est surprenant et évoque l'ébauche d'un pore apical. L'opercule, après s'être constitué, régresse-t-il, ici, en partie, sans devenir fonctionnel ? Si cette hypothèse était vérifiée, elle impliquerait une possible relation évolutive entre certaines Pezizales et des Leotiales.

Relativement à l'ultrastructure des ASCOSPORES de *Desmazierella acicola,* nos observations sont en accord avec celles de MERKUS (1976 : 19; fig. E,F,G, pl. 12). Par leur morphologie et leur structure, ces ascospores sont du même type que celles de *Sarcoscypha coccinea* (*cf.* van BRUMMELEN 1975, fig. c; SAMUELSON 1975, fig. 7; MERKUS 1976; BELLEMERE 1977, fig. A; DONADINI et *al.* 1989, fig. B; HARRINGTON 1990; LI et KIMBROUGH 1995). Elles se caractérisent par une paroi propre différenciée au stade adulte, avec en particulier une nette fibrillation radiaire, une paroi intermédiaire distincte, une périspore notable, réactive au test de Thiéry, dense, homogène, de texture granuleuse. Les ascospores des autres *Sarcoscypha*ceae, sont d'un type similaire, avec seulement une diversité de détail. Celles de *Desmazierella acicola,* sont, en outre, particulières par les petits globules lipidiques contigus qui coiffent leurs pôles, en y formant une sorte de cape, déjà remarquée par MERKUS (1976).

Les **PARAPHYSES** sont différentes des soies apothéciales. Leur développement est remarquable à plusieurs égards: elles apparaissent postérieurement aux premières soies, elles sont déjà bien développées avant l'allongement des asques (fig. 7 C), leur différenciation ampullaire et le revêtement d'excroissances de leur partie terminale sont présents avant que les asques n'atteignent leur longueur maximale.

Des paraphyses de ce type ne se rencontrent pas chez d'autres discomycètes. Certes, chez *Chorioactis* (*Sarcoscypha*ceae) , les cellules des paraphyses peuvent devenir ampullaires, mais les paraphyses restent plus courtes que les asques. Chez *Cookeina sulcipes (Sarcoscyphaceae)*, certaines paraphyses dépassent l'hyménium, parfois de plus de 45µm, par une ramification latérale qui prend l'aspect d'un poil à paroi et cloisons épaissies (LE GAL 1953, fig. 115: 250; RIFAI 1968, fig. 18: 37; DENISON 1972, fig.B, pl. 24.). Chez *Pseudoplectania nigrella (Sarcosomataceae*) il arrive aussi qu'une paraphyse isolée ressemble à un poil surplombant l'hyménium (LEGAL 1953, Fig.88: 198).

Dans ces deux derniers cas, il s'agit seulement d'une différenciation occasionnelle, et non systématique, et il n'y a pas formation d'ampoule. Chez *Unguiculella rehmii* (*Hyaloscyphaceae*, Leotiales), les paraphyses sont toutes prolongées par un poil chitineux, mais elles sont dépourvues d'ampoule (MULLER 1967).

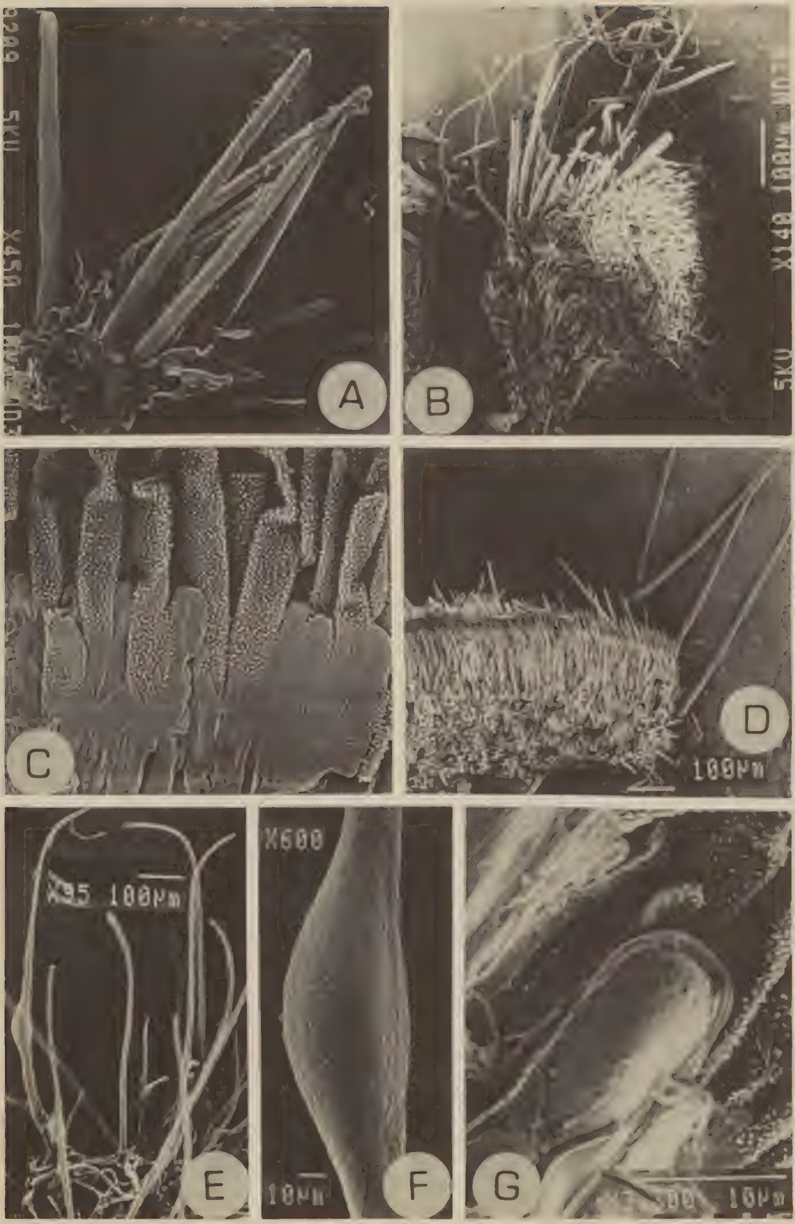
Il n'est pas rare, cependant, que chez des discomycètes, des paraphyses soient un peu plus longues que les asques et renflées en ampoule à leur sommet. C'est par exemple le cas chez *Ramgea annulispora* (Pezizales) (van BRUMMELEN 1992: 577), les *Orbiliaceae*, certaines *Geoglossaceae*, certaines *Dermateaceae* (Leotiales) où les sommets renflés des paraphyses forment un pseudoépithécium, et aussi chez *Catillaria*, (*Catillariaceae*, Lecanorales). Cette différenciation ampullaire des paraphyses, que l'on trouve dans diverses lignées de discomycètes, est cependant terminale et non intercalaire, au contraire de ce que l'on observe chez *Desmazierella.*

Chez ce dernier genre, la double différenciation des paraphyses (formation d'ampoules intercalaires et parties terminales constituant des filaments suprahyméniaux à paroi différenciée recouverte d'excroissances) est remarquable. *D. acicola* est donc une espèce spécialement adaptée au niveau de l'hyménium.

Une remarque, d'un autre ordre, doit être faite relativement aux paraphyses de *Desmazierella* . Elle concerne la discordance entre les observations rapportées ici et les figures de divers auteurs. Ainsi, selon SVRCEK (1948, fig. 13-17) les paraphyses ne présentent pas de renflement; cette observation correspond vraisemblablement à un hyménium encore jeune, placé peut-être dans des conditions de milieu en partie inhibitrices de la différenciation des paraphyses. D'autre part, les figures de PHILLIPS (1887, pl. VIII, n°51), de MASSEE (1895 : 324) et de BOUDIER (1905-1910), *Icones* II, pl. 363) représentent des paraphyses également sans renflement, mais terminées par une touffe de filaments verticillés et sombres. MASSEE (*loc. cit.*) figure de plus, en arrière-plan des paraphyses, un réseau de filaments minces et apparemment hyalins, dont il n'indique pas la nature. Une comparaison avec la photographie d'une culture de *Desmazierella* au stade imparfait (GREMMEN 1949 : 34) porte à penser que les paraphyses figurées par les auteurs ci-dessus, pourraient correspondre à des filaments conidiogènes de l'anamorphe de *D. acicola*, *Verticicladium trifidum* (GREMMEN 1949,

---

Fig. 7 . *Desmazierella acicola.* - Paraphyses et soies (MEB).
A - Très jeune stade d'apothécie (fragment): faisceau de soies avec développement de paraphyses à sa base. Les excroissances sont distinctes sur les soies et sur le sommet de certaines paraphyses. **B** - Marge d'une jeune apothécie. Les soies dont la disposition est divergente sont insérées à la marge de l'excipulum (?sympode). A droite, de nombreuses paraphyses, encore courtes, sont distinctes. **C** - Jeune hyménium. Un ensemble de paraphyses, à paroi différenciée avec excroissances, surplombe une couche de jeunes asques (ici sectionnée obliquement à sa base). **D** - Partie latérale d'un jeune hyménium. Les soies marginales sont très longues; de rares soies hyméniales plus courtes sont saillantes au-dessus de l'hyménium. La partie ampullaire des paraphyses forme un pseudoépithécium dense, plus sombre. **E** - Paraphyses isolées. Le renflement ampullaire apparaît sur deux d'entre elles. **F** - (Détail de **E**). **G** - Sommet d'asque encore immature surplombé par la partie supérieure de plusieurs paraphyses garnies d'excroissances.


A
X450
5KU
B
X140
100µm
5KU
C
D
100µm
E
X95 100µm
F
X600
10µm
G
10µm

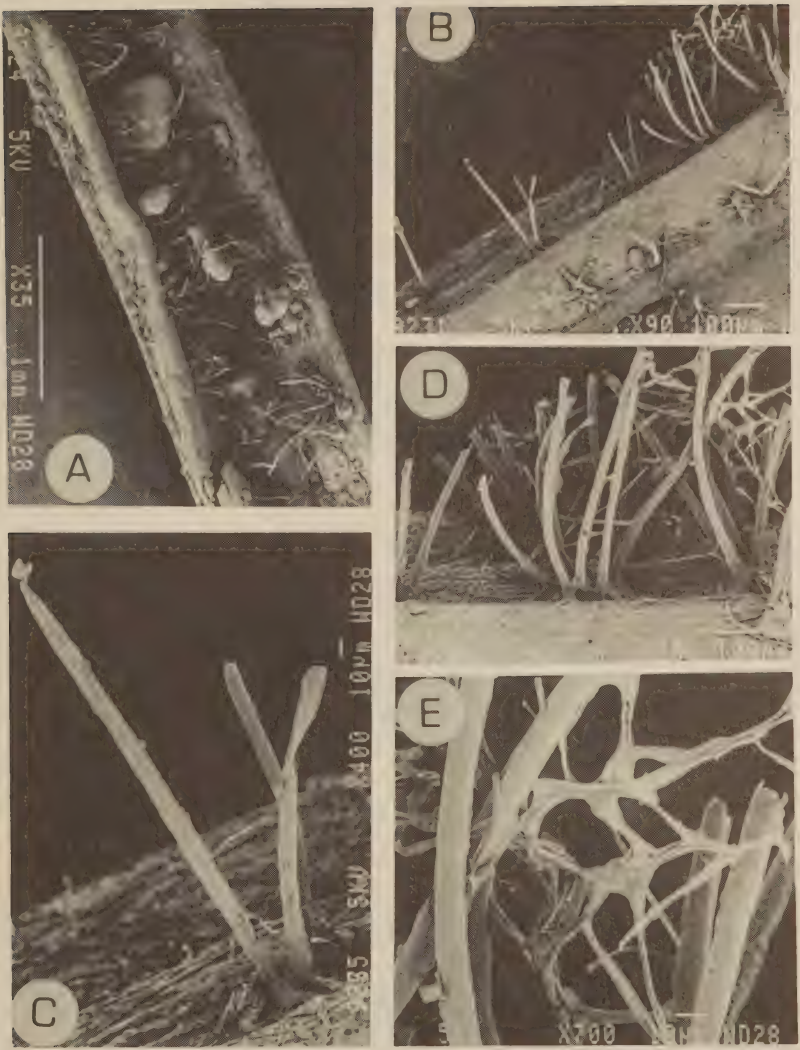
HUGUES 1951, BERTHET 1964a). Ces éléments devenus probablement sénescents et non fonctionnels à la suite du passage à la phase sexuée, ont sans doute persisté après leur ennoyage par des paraphyses et des asques. Cette hypothèse reste à vérifier. L'un d'entre nous (L.M.H.) a effectué des mises en culture en vue de tenter d'éclaircir ce point.

Relativement à l'anamorphe de *D. acicola* on notera, au passage, que celui-ci est cité par PADEN (1984) parmi les genres structuralement similaires des *Molliardiomyces*, anamorphes de diverses *Sarcoscypha*ceae, dont il diffère seulement par des conidies sèches, la pigmentation de la base des conidiophores et des détails morphologiques mineurs. C'est une confirmation de l'appartenance du genre *Desmazierella* aux *Sarcoscypha*ceae.

En ce qui concerne la structure des **SOIES** de l'ascome de *D. acicola*, nos observations sont en accord avec les illustrations des auteurs. Ces soies ne sont pas seulement marginales, mais aussi hyméniales, bien que plusieurs auteurs n'aient pas figuré ces dernières. Les modalités de leur développement restent encore imprécises. D'après nos observations, il est clair que les premières soies qui apparaissent précocement, se dressent sur un réseau mycélien aérien développé à la surface de l'aiguille de pin et forment un subiculum qui entoure plus ou moins leurs bases (fig.8).

Les jeunes ébauches d'ascome qui se forment au niveau du subiculum, sont constituées par un massif cellulaire plus ou moins sphérique, de textura globulosa, qui est revêtu de soies. La rupture du toit de cette ébauche, sans doute précoce, est contemporaine de l'initiation des premières paraphyses. Celles-ci s'organisent au milieu d'un faisceau de soies dressées (fig. 7A). Le flanc de l'ébauche devient donc celui de la cupule excipulaire, un peu résistante à la dissection (GALAN et RAITVIIR 1995, fig. 1 : 41). Sur la marge de cette cupule apparaissent alors de nouvelles soies disposées en sympode et à forte croissance : ce sont les soies marginales (fig. 7B). Simultanément, depuis le subiculum, qui persiste sous l'ébauche apothéciale, s'élèvent de nouvelles soies qui viennent s'intercaler dans l'hyménium en voie d'édification. Le développement de l'apothécie de *Desmazierella acicola*, dans sa phase initiale, pourrait être comparable à celui de certaines Rhytismatales. La faible quantité du matériel disponible ne nous a pas permis d'apporter d'autres précisions. Nous tentons, par des cultures, de confirmer la présente interprétation.

Fig. 8 . *Desmazierella acicola*. - Très jeunes stades de développement (MEB).
A - Début de développement du subiculum de *Desmazierella acicola* sur la face concave d'une aiguille morte de *Pinus sylvestris*. **B** - (Détail de **A**). Des soies plus ou moins disposées en faisceaux sont développées sur le réseau mycélien superficiel. **C** - (Détail de **B**). Très jeune stade de développement. Trois soies dressées (peut-être sur un unitium d'ascome reposant sur le subiculum). **D** - (Autre détail de **B**). Plusieurs faisceaux de soies dressées et divergentes, portés chacun sur une masse mycélienne, sont entremêlés de filaments mycéliens aériens du subiculum. **E** - (Détail de **D**). Aspect des filaments mycéliens entre les soies dressées.


B
X90 100µm
A
5KV X35 1mm WD28
D
E
X700 WD28
C
5KV X400 10µm WD28

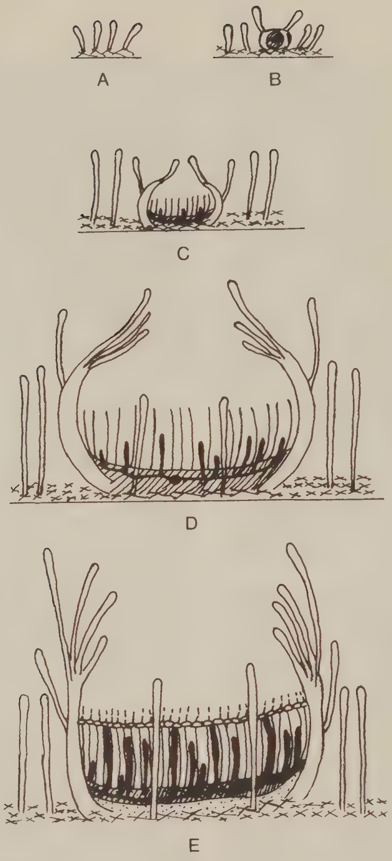


Fig. 9 . *Desmazierella acicola.* - Représentation hypothétique et schématique du développement de l'apothécie (Le mycélium inclus dans la feuille de pin n'a pas été représenté).

A - Subiculum et soies initiales. **B** - Ebauche d'ascome portant aussi des soies. **C** - Rupture du toit de l'ébauche d'ascome et apparition des premières paraphyses. **D** - Etalement de l'ébauche, jeune hyménium avec paraphyses allongées, jeunes asques et jeunes soies, (nées du subiculum basal) ; début de croissance marginale de l'ascome avec longues soies disposées en sympode. **E** - Apothécie en maturation, présence d'un hypothécium (= sous-hyménium lâche) et d'un pseudoépithécium surmonté par les filaments terminaux des paraphyses et par des soies issues du subiculum.

Des soies raides et différenciées se rencontrent chez d'autres *Sarcoscypha*ceae, telles que *Chorioactis et Thindia* (KORF et WARAITCH 1971), mais elles sont purement excipulaires. Les *Sarcosomataceae* en semblent dépourvues, mais on connaît d'autres exemples de soies chez divers autres Pezizales (*Scutellinia, Cheilymenia, Rhizina*) et chez des Leotiales telles que les *Lachnum*, les *Trichoglossum* et les genres apparentés; on en connaît de similaires chez des pyrénomycètes (*Helminthosphaeria*). Ces poils sont rarement à la fois excipulaires et hyméniaux (cas de certains *Lachnum* à "paraphyses" en lancette dont la paroi sombre est différenciée, et aussi des *Trichoglossum*). Ce qui est donc plus spécialement remarquable chez *Desmazierella*, c'est que la formation des soies se fasse précocement sur le subiculum et l'ébauche d'apothécie, et qu'elle se poursuive durablement non seulement à la marge, mais aussi dans l'hyménium, alors qu'en général la formation des soies est assez tardive et reste limitée au flanc et à la marge de l'ascome.

En fin de compte, *Desmazierella acicola* est un discomycète dont l'apothécie présente plusieurs adaptations: production prolongée de soies externes et hyméniales et différenciation importante des paraphyses en un poil terminal et une ampoule intercalaire, tous deux revêtus d'excroissances. Il est clair que de tels dispositifs sont susceptibles de favoriser le maintien de gouttelettes d'eau superficielles ou de tamponner les variations hygrométriques, ou calorifiques, de l'air. Ils peuvent aussi assurer une protection contre d'éventuels prédateurs, soit d'ordre mécanique (poils rigides) ou chimique (revêtement des protubérances). Ce n'est probablement qu'à la suite d'une longue histoire évolutive que ces dispositifs d'adaptation ont pu se réaliser chez *Desmazierella* .

CONCLUSION

Cette étude, initialement consacrée à l'ultrastructure des asques, a conduit à des observations relatives à l'ontogénie des apothécies et à leurs rapports avec les anamorphes, ainsi qu'à un certain nombre de remarques biologiques. D'un point de vue systématique, il est confirmé que ni la coloration apparente de la fructification, vive ou sombre, ni les caractéristiques de la pilosité externe de l'apothécie, suffisent à distinguer les *Sarcoscypha*ceae des *Sarcosomataceae,* mais que ces deux familles diffèrent par la structure fine de leurs asques. A cet égard, le genre *Desmazierella* appartient manifestement aux *Sarcoscyphaceae*, ce que confirme la structure de l'anaphorme (PADEN 1984) et celle des ascospores. Dans la famille des *Sarcoscyphaceae*, définie par le plan structural des asques, les genres diffèrent sensiblement par la coloration des apothécies et par les adaptations biologiques de celles-ci (paraphyses et soies de *Desmazierella* et de *Chorioactis*, par exemple). Ils diffèrent aussi par la biologie des asques (déhiscence de *Chorioactis* et de *Pseudopithyella*). Cette diversification biologique des genres, par ailleurs pauvres en espèces, analogue à ce qui est connu chez les Magnoliales parmi les plantes supérieures, laisse donc supposer que les *Sarcoscypha*ceae aient connu une longue évolution. Il est remarquable que le plan structural des asques soit resté pratiquement inchangé au cours de celle-ci. En raison de sa stabilité, ce caractère semble intéressant à considérer pour la définition des phylums (BELLEMERE 1994a). Pour ce qui est des recherches en systématique moléculaire, elles ne font que débuter dans ce groupe (HARRINGTON et POTTER 1997) et pour le moment les travaux récents de LANDVIK et *al.* 1997, utilisant l'analyse de rDNA, n'ont pas permis de classer clairement *Desmazierella* parmi les *Sarcoscyphaceae*, les *Sarcosomataceae* ou les *Otideaceae*.

REMERCIEMENTS

Nous remercions vivement Mmes. M.C. Malherbe et H. Chacun pour l'assistance technique, ainsi que MM. M. Letalnet et E. Vast pour les photographies (MET). Nous assurons aussi Mme M. Dumont, de notre particulière gratitude pour les photographies au microscope à balayage.

Le présent travail n'aurait pu être réalisé sans les facilités, spécialement appréciées, qui ont été accordées par la Direction de l'ENS de Fontenay-St.Cloud à l'un d'entre nous (A.B.) Nous sommes très reconnaissants envers les Prs. R.P. Korf et G.L. Hennebert pour leur révision constructive de notre manuscrit.

REFERENCES

BELLEMERE A. 1977 – L'appareil apical de l'asque chez quelques discomycètes : étude ultrastructurale comparative. – *Rev. Mycol.* (Paris) 41 : 233-264.

BELLEMERE A., MALHERBE M.C., CHACUN H. et MELENDEZ-HOWELL L.M. 1990 – Etude ultrastructurale des asques et des ascospores de *l'Urnula helvelloides* Donadini, Berthet et Astier et les concepts d'asque suboperculé et de *Sarcosomataceae*. – *Cryptogamie, Mycol.* 11 : 203-238.

BELLEMERE A. 1994a – Asci and ascospores in Ascomycete Systematics. – *In* Hawksworth D.L.H. "Ascomycete Systematics: Problems and Perspectives in the Nineties", Plenum Press, New York. : 11-126.

BELLEMERE A., MELENDEZ-HOWELL L.M, CHACUN H. et MALHERBE M.C. 1994b – Les asques du *Chorioactis geaster* (Ascomycetes, Pezizales, *Sarcoscyphaceae*), leur déhiscence et leurs ascospores: étude ultrastructurale. – *Nova Hedwigia* 58, 1-2 : 49-65.

BERTHET P. 1964a – Formes conidiennes de divers discomycètes. – *Bull. Soc. Myc. Fr.* 80 : 125-149.

BERTHET P. 1964b – Essai biotaxinomique sur les discomycètes. – *Univ. Lyon, Fac.* Sc : 159 pages.

BOUDIER E. 1905-1910 – *Icones Mycologicae*. – P. Klincksieck éd., Paris, pl.363.

BOUDIER E. 1907 – Histoire et classification des Discomycètes d'Europe. P. Klincksieck éd., Paris, 120 pages.

BRUMMELEN J. van. 1975 – Light and electron microscopic studies of the ascus top in *Sarcoscypha coccinea*. – *Persoonia* 8 : 259-271.

BRUMMELEN J. van. 1978 – The operculate ascus and allied forms. – *Persoonia* 10 : 113-128.

BRUMMELEN J. van. 1992 – *Ramgea* a new genus of Pezizales from the Netherlands.- Persoonia 14 : 577-582.

BRUMMELEN J. van.1994 – Problems in the Systematics of Pezizales. *In* Hawksworth D.L.H. "Ascomycete Systematics : Problems and Perspectives in the Nineties". Plenum Press, New York : 303-314.

BRUMMELEN J. van. 1978 – The operculate ascus and allied forms. – *Persoonia* 10 : 113-128.

CABELLO M.N. 1988 – Estudio sistematico del suborden Sarcoscyphineae (Pezizales, Ascomycotina) empleando técnicas numéricas. – *Boletin Soc. Argentina Bota*. 25 : 394-413.

CHADEFAUD M. 1946 – Les asques para-operculés et la position systématique de la Pezize *Sarcoscypha coccinea* Fr. ex. Jacquin. – *Comptes Rendus Ac. Sc.*, 222 : 753-754.

DENISON W.C. 1972 – Differenciation of tribes and genera in the family *Sarcoscypha*ceae. – *Persoonia* 6 : 433-438.

DENNIS R.W.G. 1978 – British Ascomycetes. – J. Cramer éd. – Vaduz. 581 p.

DONADINI J.C 1987 - Etude des *Sarcoscyphaceae s.s.* Le Gal, *Sarcosomataceae* et *Sarcoscyphaceae s.s.* Korf. Le genre *Pseudoplectania* emend. nov., *P. ericaceae* sp. nov. *(*Pézizales*).* Cytologie et scanning des asques. *Mycol. Helvet.* 2 : 217-246.

DONADINI J.C, CHACUN H., MALHERBE M.C. et BELLEMERE A. 1989 – L'ultrastructure des asques et des ascospores du *Pseudopithyella minuscula* (Ascomycetes, Pezizales, Sarcosomataceae). – *Cryptogamie, Mycol*. 10 : 283-304.

ECKBLAD F.E. 1968 – The Genera of Operculate Discomycetes. A Re-evaluation of their taxonomy, phylogeny and nomenclature. – *Nitt. Mag. f. Botanik* 15, 1 : 1-191.

ERIKSSON O.E. 1984 - Outline of the Ascomycetes. – *Syst. Asco*. 3 : 1-72.

ERIKSSON O.E. et HAWKSWORTH D.L.H. 1993 – Outline of the Ascomycetes. – *Syst. Asco*. 12, 1-2 : 51-257.

GALAN R. et RAITVIIR A. 1995 – *Desmazierella acicola* Libert in Spagna. – *Riv. di Micol*. 38 : 39-44.

GREMMEN J. 1949 – De imperfecte vorm van *Desmazierella acicola* Lib. – Fungus 19 : 32-35

HARRINGTON F.A. 1990 – *Sarcoscypha* in North America (Pezizales, *Sarcoscyphaceae*). – *Mycotaxon* 38 : 417-458.

HARRINGTON F.A et POTTER D. 1997 – Phylogenetic relationships within *Sarcoscypha* based upon nucleotide sequences of the internal transcribed spacer of nuclear ribosomal DNA. – *Mycologia* 89 : 258-267.

HUGUES S.J. 1951 – Studies on microfungi IX, *Calcarisporium*, *Verticicladium* and *Hansfordia* (*gen*. nov.). *Mycol. Papers*, 43 : 1-25.

HUHTINEN S. et MAKINEN Y. 1984 – Finnish records of Discomycetes : a new species in the monotypic genus *Desmazierella* (Pezizales). – *Mycotaxon* 20 : 551-557.

KENDRICK W.B. et CARMICHAEL J.W. 1973 – Hyphomycetes. *In* Ainsworth G.C. et *al.* – The Fungi IV A., *Acad. Press*, New York : 323-509.

KOBAYASHI Y. 1937 – On gelatinous cup-fungi, *Bulgaria* group. – *Japan. Journ. Bot.* 13 : 511-520.

KORF R.P. 1970 – Nomenclatural notes VII – Family and tribes names in the Sarcoscyphineae (discomycetes) and nex taxonomic disposition of the genera. – *Taxon* 19 *: 782-783.*

KORF R.P. et WARAITCH K.S. 1971 – *Thindia*, a new genus of the Sarcoscyphinae (Pezizales). – *Mycologia* 63,1 : 98-103.

KORF R.P. 1972 – Synoptic key to the genera of the Pezizales. – *Mycologia* 64 : 937-994.

KORF R.P. 1973 – Discomycetes and Tuberales. – *In* Ainsworth G.C. et *al.* "The Fungi. An advanced treatise". Ac. Press, New York, London : 249-319.

LANDVIK S., EGGER K.N. et SCHUMACHER T. 1997 – Towards a subordinal classification of the Pezizales (Ascomycetes) : phylogenetic analyses of SSU rDNA sequences. – *Nordic. J. Bot.* 17, 4 : 403-418.

LE GAL M. 1946a – Mode de déhiscence des asques chez les *Cookeina* et les *Leotia* et ses conséquences du point de vue phylogénétique. – *Comptes Rendus, Ac. Sc.* 222 : 755-757.

LE GAL M. 1946b – Les discomycètes suboperculés. – *Bull. Soc. Myc. France* 62 : 218-240.

LE GAL M. 1947 – Recherches sur les ornementations sporales des Discomycètes Operculés. – *Bibl. Mycol.* 28 : 1-297.

LE GAL M. 1953 – Les Discomycètes de Madagascar. – *In* Heim R. "Prodrome à une flore mycologique de Madagascar. IV". Laboratoire de Cryptogamie du Muséum d'Histoire Naturelle – Paris. 465 p.

LE GAL M. 1963 – Valeur taninomique particulière de certains caractères chez les Discomycètes Supérieurs. *Bull. Soc. Myc. France* 79 : 456-470.

LI L.T. et KIMBROUGH J.W 1995 – Spore ontogeny in species of *Sarcoscypha.* – *Mycologia* 87 : 749-758.

LIBERT M.-A. 1829 – Description d'un nouveau genre de champignons nommé *Desmazierella.* – *Ann. Sc. Nat.* Paris, 17 : 82-83.

MASSEE G. 1895 – British Fungi, Flora IV : 324-325.

MELENDEZ-HOWELL L.M., CHACUN H., MALHERBE M.C. et BELLEMERE A. 1990. – Etude ultrastructurale de l'apex de l'asque et de la paroi des ascospores dans le genre *Pithya* Fuck. (Ascomycetes, Pezizales, *Sarcosomataceae).* – *Anales Inst. Biol. Univ. Nac. Auton. Mexico, Ser. Bot.* 60 : 9-20.

MERKUS E. 1976 – Ultrastructure of the ascospore wall in Pezizales (Ascomycetes) IV. *Morchellaceae, Helvellaceae, Rhizinaceae, Thelebolaceae and Sarcoscyphaceae.* General discussion. – *Persoonia* 9 : 1-38.

MÜLLER E. 1967 – Neufunde von *Hyaloscyphaceae* aus den Alpen. – *Sydowia* 21 : 143-153.

NANNFELDT J.A. 1949 – Contributions to the mycoflora of Sweden, 7. A new discomycete *Urnula Hiemalis* Nannf. n. sp., and a short account of the Swedish species of *Sarcoscyphaceae.* – *Svensk. Bot. Tidskrift* 43 : 468-484.

PADEN J.W. 1984 – A new genus of Hyphomycetes with teleomorphs in the *Sarcoscyphaceae* (Pezizales, Sarcoscyphineae*).* – *Can J. Bot.* 62 : 211-218.

PHILLIPS W. 1887 – British Discomycetes – London : 283 et pl. VIII, fig.51.

RIFAI M.A. 1968 – The australasian Pezizales in the herbarium of the Royal Botanic Gardens Kew. – *N.V. Noord-hollansche Uitgevers Maatschappij*, Amsterdam, 295 pages.

SACCARDO P.A. 1889 – *Sylloge Fungorum* 8 – Padue : 1 à 1143.

SAMUELSON D.A. (1975) – The apical apparatus of the suboperculate ascus. – *Can. J. Bot.* 53 : 2660-2679.

SAMUELSON D.A., BENNY G.L. et KIMBROUGH J.W. 1980 – Asci of the Pezizales VII. The apical apparatus of *Galiella rufa* and *Sarcosoma globosum* : reevaluation of the suboperculate ascus. – *Can. J. Bot.* 58 : 1235-1243.

SVRCEK, M. 1948 – Bohemican species of *Pezizaceae* subf. *lachneoideae*. - *Sbor. Nar. Mus. Praze* 48 : 195 p. + 7 pl.

MYCOTAXON

Volume LXVIII, pp. 75-129 July-September 1998

ANNOTATED CHECKLIST OF NEW CALEDONIAN BASIDIOMYCOTA. I. HOLOBASIDIOMYCETES

E. HORAK
Herbarium, Geobotanical Institute, ETH, Zollikerstrasse 107,
CH-8008 Zürich, Switzerland (E-mail: horak@umnw.ethz.ch)

J. MOUCHACCA
Laboratoire de Cryptogamie, Muséum National d'Histoire Naturelle,
12 rue Buffon, F - 75005 Paris, France (E-mail: mouch@mnhn.fr)

ABSTRACT :

An annotated check-list of non-phytopathogenic basidiomycetes from the island of New Caledonia and its dependancies (Loyalty Islands and Isle of Pines) is presented. Scanning publcations stressed the necessity to also include the few early records of this group of fungi reported from French Polynesia and Samoa. The content of the list was drawn from available publications, while corresponding holotypes and additional specimens were checked in herbaria. Altogether more than 300 taxa have been found. For the island of New Caledonia this document is believed to be fairly exhaustive, on the basis of published information; unreported specimens encountered during herbarium searches were not included in this study.

Almost one third of the included taxa proved to have protologues based on material collected in New Caledonia. Such a high proportion of novel taxa underlines the marked biodiversity of this ecological group of fungi in this tropical island. Extensive collection and further taxonomic work is, however, needed for a satisfactory circumscription of the local basidiomycete biota. Interesting discoveries await especially if we consider the strong endemic character of the vascular flora of New Caledonia.

The fungi treated are listed alphabetically following the original reported names rather than an updated generic placement. Taxa are listed with full original references and collecting information; presence or absence of authentic material is indicated. Generic transfers are underlined and sometimes a synonymy is reported. A list of the same but following current names is also provided. It should allow a rapid check for the presence of a particular fungus in the area. Many of the species listed appear to be undocumented since their proposal; further taxonomic work is thus needed to ascertain their correct placement.

Publication of this list represents a landmark in our knowledge of basidiomycete taxa in New Caledonia and similar tropical islands in the South Pacific Region. Its appearance should initiate interest in this group of fungi by providing basic information.

KEY WORDS: fungi, basidiomycetes, biodiversity, New Caledonia, South Pacific, check-list, taxonomy, taxonomic status.

INTRODUCTION

The island of New Caledonia lies in a N-W to S-W direction between 20 and 22 °S latitude off the eastern coast of Australia. This emerging land is part of the Indo-Malaysian archipelago including Papua New Guinea, New Caledonia and New Zealand. The main island of New Caledonia is over 400 km long, but only 50 km at its widest point. The landscape is very abrupt with successive deep valleys and despite the tropical location, the climate is relatively temperate as a result of its insularity. New Caledonia has an extremely diverse and interesting flora comprising over 3000 vascular plant species (Hallé, 1977). Many are endemic and several primitive plant genera also occur. This would suggest the possible existence of interesting and so far unexplored plant/fungus associations.

The botanical exploration of New Caledonia began with the expeditions of Cook in 1774, discoverer of the island, and of d'Entrecasteaux in 1793. During the following fifty years, scattered collections were made by visiting naval officers and missionaries. Knowledge of the New Caledonian flora was transformed following the establishment of a European settlement in 1853. This was principally because of the first intensive collections made over two decades by Vieillard and Déplanche, naval surgeons posted to small isolated garrisons, or to vessels making hydrographic surveys. Beside collecting in many coastal areas, Vieillard and Déplanche also visited much of the interior. Their activity overlapped with that of two other important collectors, Pancher and Balansa, who worked in New Caledonia for the Muséum d'Histoire Naturelle, Paris. McKee (1966) provided an excellent account of the first botanical studies concerning this island.

The numerous collections made by Vieillard & Déplanche were distributed by Lenormand, a lawyer and amateur botanist of Vire (Calvados, France), and sent to most of the major herbaria of the period. The enormous botanical correspondance of Lenormand comprises letters mostly written by Déplanche. In letter No. 210 (dated April 29, 1863), Déplanche indicates "J'ai recueilli des champignons et j'ai réussi à en conserver un certain nombre; malheureusement je n'ai aucune donnée sur leur préparation" (McKee & McKee, 1981). These specimens and the material collected by Pancher and Balansa, are assumed to be housed in the Paris Herbarium (Muséum d'Histoire Naturelle).

The collecting of fungi in New Caledonia was principally carried out around the turn of the century and in the 1960s. The main taxonomic contributions of these times were from Patouillard (1887-1915), Wakefield (1916, 1922), Wakefield *et al.* (1916) and Huguenin (1964-69). Nonetheless, few fungi of New Caledonia have been included in monographs and cultural studies have not been undertaken, except for phytopathogens.

In 1862, Vieillard reported "local inhabitants consume a *Hydnum* close to *H. caput-medusae* Fr. and at Port-de-France (actual Nouméa), *Agaricus edulis* Bull.? is a delicacy for the newcomers". Twenty-five years later the first notable contribution by Patouillard appeared, who enumerated 64 species deposited in the Museum at Paris. Basidiomycetes *sensu lato* represent the major part with five taxa being new to science. In the same year 1887, Müller (Müller-Argiovensis) while reporting on lichens collected around Nouméa, presented a list of seven basidiomycetes sent by Savés to Roumeguère. Patouillard's preliminary investigation of New Caledonian fungi was the prelude to a series of papers focussing entirely on this island (Patouillard, 1906, 1907, 1908, 1909, 1911, 1915). His interest was, however, not limited to New Caledonia but overlapped with other islands of the South Pacific and several regions of the five continents (Pfister, 1977).

Basidiomycetes from New Caledonia were also reported by Patouillard (sometimes co-authored with Hariot, 1903, 1912) in publications dealing with fungi collected elsewhere; these appeared between 1887 and 1912. The relevant New Caledonian speci-mens dealt with in the papers came exclusively from the activity of resident collectors. Most notable were two school teachers established at Nouméa, Le Rat (and his wife Louise) and Franc, and the director of the local natural history museum, Bernier. Between 1900 and 1911 several interesting taxa were collected principally by Le Rat, who also sent material directly to other European mycologists for identification (Hennings, 1903). A collection of 84 species was mailed by Bernier in 1902 to the Paris Musem *via* the Ministry of Colonies; these were gathered mostly around Nouméa and the Isle of Pines (Hariot & Patouillard, 1903). Other contributions of Patouillard focus mainly on fungi (including basidiomycetes) collected by Seurat from the Gambier Archipelago (Patouillard, 1904) or from French Polynesia (Patouillard, 1906c) and by Lloyd from Samoa (Bresadola and Patouillard, 1901).

In 1911-12, Sarasin and Roux from Basle, Switzerland made a large and fairly representative collection of fungi from the nearby Loyalty Islands. Between 90 and 100 species were subsequently named at the Royal Botanic Gardens, Kew. Descriptions of the new species included in this collection were issued by Wakefield *et al.* (1916) but owing to the war the full list was not published until 1920 in Sarasin & Roux. Two years after the Swiss expedition, Prof. Compton's collection from the main island added several new records, including two new species.

Interest in the New Caledonian flora (including fungi) drastically decreased after World War I. This was in part a consequence that the faster new steamships bypassed the island. This situation prevailed until the advent of World War II. The strategic importance of the island in the South Pacific Region then triggered the establishement at Nouméa of the Institut Français d'Océanie (IFO) in 1949, now Centre ORSTOM de Nouméa (Mouchacca, 1990a, 1997). The South Pacific Commission was also created to enhance research in various fields of local interest of the widespread islands of this region.

The new Institut Français d'Océanie marked a surge of local research focusing mainly on fungi involved in phytopathological disorders. The study of non-pathogenic basidiomycetes was then the only concern of mycologists visiting the island or receiving material from local correspondents. Among notable visitors are Heim and Horak. The former collected in the island on two occasions in addition to receiving specimens. In a series of papers from 1965-68, Heim provided descriptions and diagnoses of several interesting higher fungi. However, he did not undertake a survey of this group, despite much material accumulating in the Paris Herbarium. Horak visited the island four times (1967, 1977, 1994 and 1996). This interest was in line with the former French-Swiss exploration and collecting mission to New Caledonia undertaken earlier by two Zurich University botanists, *viz.* Baumann-Bodenheim and Huerlimann. The trend was, in fact, initiated several decades earlier by the Swiss botanist Daeniker, who visited the island between 1924 -26.

Attempts to produce surveys for the non-pathogenic fungi (including basidiomycota) for this part of the world are rather rare. Horak and Kobayasi (1978) prepared a list of New Guinean species of Agaricales while Shaw (1984) provided a list of microorganisms observed in the same. Mouchacca (in press) surveyed new records of ascomycetes described from New Caledonia. He also provided some information on hyphomycetes inhabiting forest litter (Mouchacca 1990b, 1990c and Mouchacca & Zucconi, 1994). Finally, a survey of the latter group of fungi in the island was initiated by Mouchacca & McKenzie (1994).

The present contribution is part of a series of papers relating to various taxonomic groups of fungi. It focuses on saprotrophic and phytopathogenic basidiomycetes collected on the main island of New Caledonia and its dependancies. It does not claim to be a comprehensive document on higher fungi sampled in the New Caledonia area, although hopefully no publications relating to this topic has been overlooked by the authors. Unreported specimens, identified or not, are present in major herbaria. However, in absence of updated catalogues, it is difficult to ascertain their existence.

LIST & BIOGRAPHICAL DETAILS OF PRINCIPAL COLLECTORS OF NC MYCOTA

AUBREVILLE, André (1897-1982) - Graduated as an engineer from the "Ecole Polytechnique de Paris" in 1922, before attending the "Ecole des Eaux et Forêts des Colonies". Later employed as a Forest Engineer in Africa (Ivory Coast) until 1937. From 1939-1955, he was appointed General Inspector of the French Overseas Forest Services and accordingly often travelled to several destinations in the French Empire. From 1958-1967, Professor Aubréville was in charge of the "Laboratoire de Phanérogamie du Muséum National d'Histoire Naturelle de Paris" (MNHN). Under his leadership, several floras were issued by the Laboratoire de Phanérogamie, including that concerning New Caledonia and neighbouring islands.

BALANSA, Benjamin (1825-1891) - Famous French explorer and plant collector who lived in New Caledonia and the Loyalty Islands from 1868 to 1872. He collected on behalf of the MNHN in Paris.

BAUMANN-BODENHEIM, Marcel Gustav (1920-1996) - Swiss botanist working on New Caledonian plants from the beginning of his studies at the University of Zürich. Together with A. Guillaumin, member of the French-Swiss exploration and collecting mission to New Caledonia (1950-1952). Author of many botanical publications, including the uncompleted "Systematik der Flora von Neu-Kaledonien". Collected about 15.000 specimens of plants (and macrofungi) now kept in several important herbaria (A, ILL, MICH, NY, PC, US and Z+ZT).

BERNIER, Julien (1848-1903) - Born January 14, 1848 on the island La Réunion where his father Charles Bernier (1802-1858) was director of the local botanic garden. He worked as a reporter in New Caledonia where he was elected General Councelor in 1885. In 1894, he was appointed Director of the "Muséum de Nouméa du Ministère des Colonies", a position he occupied until his death. This function aroused his interest in the local flora, an activity he shared with the former convict Léon Cribs. Starting in 1898, more than 2000 botanical specimens were sent by these two collectors to Paris (MNHN). Bernier died at Nouméa on March 3, 1903.

BUGNICOURT, Francis (1907-1991) - Phytopathologist, famous at one time for his publication "Les *Fusarium* et *Cylindrocarpon* de l'Indochine (1939)", prepared during his stay (1931-1946) in former Indochina at the "Institut des Recherches Agronomiques et Forestières de Saigon". He arrived in Nouméa in February 1948 as Assistant-Director of the Institut Français d'Océanie (IFO and later Centre ORSTOM de Nouméa) until his retirement in May 1962. Bugnicourt studied fungi in pure culture and his main interest related to the phytopathology of cultivated plants in New Caledonia and Vanuatu (Mouchacca, 1997).

COMPTON, Robert Harold (1886-1979) - British botanist who worked in South Africa. He was appointed as Director of the Kirstenbosch Botanical Garden from 1919 and Professor of Botany at the University of Cape Town. Collected in New Caledonia in 1914.

DAENIKER, Albrecht Ulrich (1894-1957) - Swiss botanist who explored the New Caledonian flora and vegetation between 1924-1926. Numerous plant specimens (and several macrofungi) are lodged in the Herbarium Zürich (Z + ZT). As Professor and Director of the Institute for Systematic Botany and Plant Geography at the University of Zürich, he was, in particular, interested in the phylogeny of the angiosperms, ecology and plant geography.

DYBOWSKI, Jean (1857-1928) - As General Inspector of the Colonial Service of Agriculture, Dybowski collected plants and cryptogams in several parts of the French Empire; he was elected member of the French Agricultural Academy of Sciences. His collections from Central Africa were made together with Charles Chalot.

FILHOL, Henri (1843-1903) - French scientist and professor at the "Laboratoire d'Ana-tomie Comparée du MNHN de Paris". He was a member of the French expedition sent to observe the transit of Venus in the South Pacific (1874-1875). Filhol also collected many plant specimens on Campbell Island and in New Zealand.

FRANC, Isidore (1861-1930) - French school teacher in Nouméa. He collected intensively between 1905-1930 in the forested mountain ranges in the southern parts of New Caledonia (especially at Mont Dzumac).

GUILLAUMIN, André (1884-1974) - French botanist, working at the MNHN in Paris. He was involved in the study of New Caledonian plants from 1911-1967. Together with M.G. Baumann-Bodenheim, member of the French-Swiss exploration and collecting mission to New Caledonia (1950-1952), he collected a large number of plant specimens and fungi.

HARIOT, Paul Auguste (1854-1917) - French phycologist. In 1883 he was the official botanist of the Mission to Cape Hoorn on "La Romanche". After his return he was appointed as preparator at the Paris Museum and later as assistant to Philippe van Tieghem, the famous morphologist. Hariot also actively collaborated with N. Patouillard.

HEIM, Roger (1900-1979) - French mycologist, former student of N. Patouillard. He collected fungal specimens in many parts of the world. The New Caledonian material is lodged in PC. Prof. Heim kept the position as Director of the "Laboratoire de Cryptogamie, MNHN, Paris," from 1946 until his retirement in 1972. In addition, he was elected three times as Director of the Muséum National d'Histoire Naturelle. Heim was a member of the French Academy of Sciences and the French Academy of Agriculture.

HORAK, Egon (1937*) - Austrian mycologist who visited New Caledonia in 1961, 1977, 1994 and 1996. He mainly collected agarics and boletes in central and southern New Caledonia. His material is kept in the Herbarium Zürich (Z+ ZT).

HUERLIMANN, Hans (1921*) - Swiss botanist with main interests in bryology and ecology. Together with M.G. Baumann-Bodenheim and A. Guillaumin, he was a member of the French-Swiss Expedition to collect New Caledonian plants (1950-1952). Since 1958 he was responsible for both a plant conservation project in the Yaté river catchment and the establishment of a conservation park in New Caledonia. His New Caledonian moss (and fungal) collections are located in the herbaria of Geneva (Conservatoire Botanique, G) and Zürich (Z + ZT).

HUGUENIN, Bernard (?*) - Phytopathologist, worked at the ORSTOM Center at Nouméa (1962 to 1968).

LA BILLARDIERE, Jacques Julien Houttou (1755-1834) - He was a naturalist, on board (1791-1796) of the the French expedition vessels “La Recherche” and “L'Espérance”, in search for La Pérouse, who disappeared in the Pacific in 1788. He collected in Balade, New Caledonia, during three weeks in April 1794.

LEPINE, Jules (1817-1884) - French pharmacist, employed by the French Navy. He collected fungi, lichens and mosses in Tahiti (1847), subsequently described by Montagne.

Le RAT, Auguste Joseph (1872-1910) - French school teacher in Nouméa. Between 1900 and 1910 he carried out many collecting trips often accompanied by his wife Louise, who also gathered specimens alone as her husband did not have time through his teaching commitments. Most of his specimens were examined and subsequently published by N. Patouillard. The original material is kept both in Paris Cryptogamie and Farlow Herbarium.

MARTY, Jean (?*) - Phytopathologist who worked at the ORSTOM Center in Nouméa (1959-1964).

NOTHIS, Alfred (?*) - Pharmacist who mainly studied medicinal plants at the ORSTOM Center in Nouméa (1965-1968).

PANCHER, Isidore (1814-1877) - The first and then only official French botanist who has been appointed to New Caledonia in 1857 or 1859 (Sayre, 1975). He was employed until 1869 on behalf of the MNHN in Paris. After living several years in France, he returned to New Caledonia in 1874 (invited by the Belgian horticulturist Linden) and remained on the island until his death in 1877 (McKee & McKee, 1981).

ROUX, Jean - cf. SARASIN, Karl Friedrich

SARASIN, Karl Friedrich (1859-1942) - Swiss explorer, zoologist and plant collector who visited New Caledonia and Loyalty Islands (1911-1912) together with J. Roux. The large fungus herbarium has been worked up by mycologists of the Royal Botanic Gardens, Kew (UK).

SAVES, Théophile (?-?) - Related by marriage to B. Balansa, and on the advice of the latter emigrated to New Caledonia. He is well known for the ethnographic collections given to several European museums and collected at Mount Atso, New Caledonia, in 1886 and 1887. At the request of Roumeguère then living in Toulouse, Savés collected cryptogams subsequently identified by J. Müller-Argiovensis (lichens), C. Müller (bryophytes) and C. Winter (fungi).

SCHMID, Maurice (1922*) - Botanist at the Nouméa ORSTOM Center in Nouméa (1964-1975).

SEURAT, Léon Gaston (1872-?) - After obtaining his Doctorate in Natural Sciences in Paris (1899), Seurat worked as a zoologist with the “Laboratoire de Biologie Appliquée aux Colonies de l'Ecole des Hautes Etudes”. From 1902 to 1905 he was officialy sent to the French Islands in the South Pacific (Tahiti, Tuamotu, Gambier) where he collected various groups of plants.

VEILLON, Jean-Marie (?*) - French botanist, originally (1964) employed by the “Services des Eaux et Forêts de Nouvelle-Calédonie”. In 1970, he joined the “Laboratoire de Bot-anique” at ORSTOM Center in Nouméa.

VIEILLARD, Eugène (1819-1896) - Surgeon with the French Navy. He collected plant specimens in Tahiti (1855) with I. Pancher before arriving in 1857 in New Caledonia where he stayed until 1860. After a break of two years in France (1860-1862) he re-turned again to New Caledonia in 1869 (Sayre, 1975). According to McKee &

McKee (1981), Vieillard continued to gather botanical specimens in New Caledonia, often in company with E. Déplanche (1824-1875), surgeon of the Navy.

ENUMERATION OF NON PHYTOPARASITIC BASIDIOMYCETES

For each taxon treated, the full reference of the original binomial is indicated, if still valid. Alternatively the latest taxonomically accepted binomial is also included with its corresponding full citation. For names published before 1920, the volume (s) of Saccardo's *Sylloge Fungorum* are added under the heading literature. These are cited whenever the corresponding binomial could be traced following the relevant general index authored by Reed and Farr (1993). Then follows the references of post-description citations. Information about the original date and place of collection, host or substrate and the collector are also specified. In some cases several collections are listed, the same information is repeated for each record. Finally rejected generic transfers and occasionally widely known but invalid synonyms are also mentioned. Citation of author's names follows Kirk & Ansell (1992).

For early described taxa, the presence of authentic material was checked mainly in Paris Herbarium (PC) and Royal Botanic Gardens, Kew (K). Pfister's (1977) annotated index to fungi described by Patouillard was consulted for material kept at Farlow Herbarium (FH).

Herbaria:	FH	Farlow Herbarium, Cambridge, MASS, USA
	IFO	Institut Français d'Océanie, Nouméa
	K	Royal Botanic gardens, Kew, UK
	PC	Paris Herbarium, Paris, France (located in MNHN)
	MNHN	Muséum National d'Histoire Naturelle, Paris, France
Localities:	LI	Loyalty Islands (Iles Loyauté)
	NC	New Caledonia (Nouvelle Calédonie)
	PF	Polynésie Française
	PS	Pacifique Sud

*	indicates new taxon described from New Caledonia
!	indicates material has been examined by the authors
ital.	indicates current taxonomic position of species

⇒***Agaricus (Lepiota) australis*** Mont. 1848. Ann. Sci. Nat., sér. 3, 10: 117.
Syn.: *Lepiota australis* (Mont.) Sacc. 1887. Syll. Fung. V: 68. (Mont. Cent. 6: 6; Syll. Crypt., 324).
Lit.: V: 68. - Reed & Farr (1993: 393).
PF: Tahiti, on moist soil, leg. Lépine (PC).

⇒***Agaricus campester*** L. 1753. Spec. Pl. 2: 1171.
Lit.: V: 997. - Patouillard 1887: 168. - Hariot & Patouillard 1903: 12.
NC: No specimen in PC. Material published in 1887 was collected earlier by Vieillard & Pancher and Balansa (1868-1870).

⇒*Agaricus (Lepiota) echinodermatus** Cooke & Massee 1887. Grevillea 16: 30.
Syn.: *Lepiota echinodermata** (Cooke & Massee) Sacc. 1891. Syll. Fung. IX: 8.
Lit.: IX: 8. - Reed & Farr (1993: 394).
NC: Locality unknown, probably on wood, leg. Hodgson (holotype, K).

Current name: ***Cyptotrama chrysopepla*** (Berk. & M.A. Curtis) Singer 1973. Sydowia Beih. 7: 34.
⇒***Amanita pumila**** Massee in Wakef. *et al.* in Schinz 1916. Viertelj. Natf. Ges. Zürich 61: 628.
Syn.: *Amanita pumila* Massee in Wakef. in Sarasin & Roux 1920: 90 (diag. lat. superfl.).
Lit.: Not cited in Reed & Farr (1993).
NC: Yaté, on soil in coastal tropical forest, (23) 26 III 1912, leg. Sarasin & Roux (holotype, K).
⇒*Amauroderma rude* (Berk.) Torrend 1920. Brot., Bot. 18: 127.
Bas.: *Polyporus rudis* Berk. 1839. Ann. Nat. Hist., 3: 323.
Lit.: Not cited in Reed & Farr (1993). - Cunningham (1965: 142).
NC: Locality, substrate and collector unknown.
Current name: ***Amauroderma rude*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 143.
⇒*Androsaceus rhodocephalus* (Fr.) Pat. 1888. Bull. Soc. Mycol. Fr. 4: 20.
Bas.: *Marasmius rhodocephalus* Fr. 1838. Epicrisis, 382.
Lit.: Hariot & Patouillard 1903: 12.
NC: Nouméa, on branchlets of *Lantana* sp. (Verbenaceae), VIII 1900, leg. Bernier 96 p.p., 101 (PC, filed under *Marasmius).*
Current name: ***Marasmius haematocephalus*** Mont. in Fr. 1838. Epicrisis, 376.
⇒***Androsaceus umbrinus**** Pat. 1905. Agric. Prat. Pays Chauds 5: 525.
Lit.: Not cited in Reed & Farr (1993) or Pfister (1977).
NC: Nouméa, on decaying pods and small fallen branches of leguminous plants, leg. Le Rat 1114 (holotype, PC).
⇒***Auricularia auricula*** (L.) J. Schroet. 1888. Krypt. Fl. Schles. 3: 386.
Bas.: *Tremella auricula* L. 1753: Sp. Pl., 1157.
Lit.: Patouillard 1906c: 45.
PF: Locality and substrate unknown, leg. Seurat (no specimen in PC).
⇒*Auricularia buccina** Pat. 1898. Bull. Soc. Mycol. Fr. 14: 154.
PF: Tahiti, on tree trunks, leg. Pancher 1277 (holotype, FH).
Current name: ***Hirneola buccina*** (Pat.) Sacc. & Trotter 1902. Syll. Fung. XVI: 216.

According to Lowy (Mycologia 44: 684, 1952) this species was based upon a specimen from Tahiti, but its description is not sufficiently complete to permit identification.

⇒***Auricularia delicata*** (Fr.) P. Henn. 1894. Engler's Bot. Jahrb. 18: 24.
Bas.: *Laschia delicata* Fr. 1838. Epicrisis, 499.
Lit.: II: 407.
NC: La Crouen, on dead tree, 12 VII 1964, leg. Huguenin NC 64-405, NC 64-426 (K); same locality, on dead tree, 13 VII 1964, leg. Huguenin NC 64-475, NC 64-476 (K).
⇒***Auricularia mesenterica*** Fr. 1838. Epicrisis, 555.
Lit.: VI: 672. - Wakefield in Sarasin & Roux 1920: 103.
LI: Lifou, substrate unknown, leg. Sarasin & Roux 223 (no specimen in K).
⇒*Auricularia tremellosa* (Fr.) Petch 1910. Ann. Roy. Bot. Gdn. Peradeniya 4: 414.
Bas.: *Merulius tremellosus* Fr. 1838. Epicrisis, 500.
Lit.: VI: 762. - Patouillard 1902a: 767. - Wakefield 1922: 90.
NC: Mont Doré, substrate unknown, IV (no specimen in K).
Current name: ***Auricularia mesenterica*** Fr. 1838. Epicrisis, 555.

⇒***Auricularia velutina*** (Lév.) Pat. 1887. J. Bot. (Morot) 1: 225.
Bas.: *Laschia velutina* Lév. 1844. Ann. Sci. Nat., sér. 3, 2: 217.
Lit.: Hariot & Patouillard 1903: 6. - Not cited in Reed & Farr (1993).
NC: La Foa, Tendéa, on rotten wood, VII 1900, leg. Bernier 56 (PC).
Probably contaxic with *Auricularia delicata*.

⇒***Austroboletus novaezelandiae*** (McNabb) Wolfe 1979. Bibl. Mycol. 69: 115.
Bas.: *Porphyrellus novaezelandicus* McNabb 1967. New Zealand J. Bot. 5: 536.
Lit.: Horak 1980c: 78.
NC: Païta, Mont Mou, 1100 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-15 (ZT !); same locality, 22 II 1977, leg. Horak 77-31 (ZT !).

⇒***Boletellus ananas*** (M.A. Curtis) Murrill 1909. Mycologia 1: 10.
Bas.: *Boletus ananas* M.A. Curtis 1848. Amer. J. Sci. II 6: 251.
Lit.: VI: 18. - Singer 1945: 123.
NC: Locality unknown, on iron-rich soil, leg. Le Rat 1808 (FH !).

⇒***Boletellus emodensis*** (Berk.) Singer 1942. Ann. Myc. 40: 18.
Bas.: *Boletus emodensis* Berk. 1851. Hooker's J. Bot. 3: 48.
Lit.: VI: 20. - Horak 1980d: 96.
NC: Locality, substrate and collector unknown (Singer 1942: l.c.).

⇒***Boletellus pallescens*** (Cooke & Massee) Gilbert 1931. Les Bolets, 107.
Bas.: *Strobilomyces pallescens* Cooke & Massee 1889. Grevillea 18: 5.
Lit.: IX: 159; XVII: 101; XX: 907. - Hariot & Patouillard 1903: 11.
NC: Ile des Pins, substrate unknown, IX 1901, leg. Bernier 1117 (PC).
According to Reed & Farr (1993) a synonym of *S. excavatus* (Kalchbr.) P. Henn.

⇒***Boletus perroseus**** E. Horak 1980. Sydowia 33: 39.
NC: Païta, Mont Mou, 1150 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-28 (holotype, ZT !).

⇒***Boletus phytolaccae**** E. Horak 1980. Sydowia 33: 41.
NC: Païta, Mont Mou, 1200 m, on rotten wood in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-20 (holotype, ZT !).

⇒Bovistella scabra Lloyd 1906. Mycol. Not. 23: 282.
Lit.: XIX: 198. - Wakefield in Sarasin & Roux 1920: 105.
NC: Yaté, on red clay in coastal tropical forest, 23 III 1912, leg. Sarasin & Roux (K).
Current name: ***Lycoperdon scabrum*** (Lloyd) C.G. Cunningham 1926. Trans. N. Z. Inst. 57: 199.

⇒***Calocera glossoides*** (Pers.) Fr. 1821. Syst. Mycol. 1: 487.
Lit.: VI: 736; XII: 66. - Wakefield in Sarasin & Roux 1920: 103. - Reed & Farr 1993: 93.
NC: Hienghène, substrate unknown, leg. Sarasin & Roux 61 (no specimen in K).

⇒*Calvatia cyathiformis* (Bosc) Morgan 1890. J. Cinc. Soc. Nat. Hist. 12: 168.
Bas.: *Lycoperdon cyathiforme* Bosc 1811. Mag. Ges. Natf. Fr. Berlin 5: 87.
Lit.: VII: 123. - Hariot & Patouillard 1903: 13. - Patouillard 1905: 525.
NC: Several localities, on soil, XI and XII 1900, leg. Bernier (no specimen in PC); La Foa, on soil, leg. Le Rat 1076 (no specimen in PC).
Current name: ***Calvatia lilacina*** (Berk. & Mont.) Henn. 1904. Hedwigia 43: 205.

⇒***Catilla pandani**** (Pat.) Pat. 1915. Bull. Soc. Mycol. Fr. 31: 32.
Bas.: *Cyphella pandani** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 47.
Lit.: XXI: 423, XXIII: 547. PF: Iles Gambier, Rikitea, on fallen branches of *Pandanus* sp. (Pandanaceae), leg. Seurat 1893 (holotype, FH).

Doubtful non-cyphelloid taxon, probably belonging to *Physalacria* (W.B. Cooke 1961: 109).

⇒*Ceriporia viridans* (Berk. & Broome) Donk 1933. Med. Bot. Mus. Univ. Utrecht 9: 171.
Bas.: *Polyporus viridans* Berk. & Broome 1861. Ann. Mag. Nat. Hist., sér. 3, 7: 379.
Syn.: *Poria viridans* (Berk. & Broome) Cooke 1886. Grevillea 14: 112.
Lit.: VI: 316. Not cited in Reed & Farr (1993).
NC: Col de la Pirogue, 300 m, on rotten wood, tropical forest, 21 II 1977, leg. Horak, det. Ryvarden (ZT).
Current name: ***Physisporinus viridans*** (Berk. & Broome) Teixera 1992. Rev. Bras. Bot. 15: 126.

⇒*Cladoderris blumei* Lév. 1844. Ann. Sci. Nat., sér. 3, 2: 213.
Lit.: VI: 550. - Patouillard 1905: 522.
NC: Nouméa, on *Acacia lebbeck* (Mimosaceae), leg. Le Rat 1068 (PC).
Current name: ***Cymatoderma blumei*** (Lév.) D.A. Reid 1958. Kew Bull. 13: 521.

⇒***Cladoderris infundibuliformis*** (Klotzsch) Fr. 1849. Sv. Vetensk. Akad. Handl. 69: 141.
Bas.: *Actinostroma infundibuliformis* Klotzsch 1843. Fung. Meyen., 237.
Lit.: VI: 548. - Patouillard 1887: 172. - Hariot & Patouillard 1903: 7.
NC: Bourail, on tree trunks, leg. ? (no specimen in PC); Yahoué, on rotting lianas, IV 1900, leg. Bernier 7 (no specimen in PC); Ile des Pins, substrate unknown, IX 1901, leg. Bernier (no specimen in PC).

Identity of taxon doubtful.

⇒*Cladomeris sulphurea* (Bull.: Fr.) Pat. 1887. Hymén. Europ., 138.
Bas.: *Boletus (Polyporus) sulfurea* Bull. 1789. Herb. Fr., t. 429.
Lit.: VI: 104; XX: 68. - Patouillard 1887: 171.
NC: Bourail, on tree trunks, collector unknown (no specimen in PC).
Current name: ***Laetiporus sulphureus*** (Bull.: Fr.) Murrill 1920. Mycologia 12: 11.

⇒***Claudopus miraculosus**** E. Horak 1980f. Nova Hedwigia Beih. 65: 33.
NC: Yaté, 30 m, on rotten wood of tree, coastal tropical forest, 3 III 1977, leg. Horak 77-171 (holotype, ZT !).

⇒*Clavaria flabellata** Wakef. 1922. J. Linn. Soc. Bot. 46: 90.
Lit.: Not cited in Reed & Farr (1993).
NC: Mont Canala, 500 m, on forest litter, 1914, leg. Compton 1276 (holotype, K).
Current name: ***Aphelaria flabellata*** (Wakef.) Corner 1950. Monogr. Clav., 186.

⇒*Clavaria fusiformis* (Sowerby) Fr. 1821. Syst. Mycol. 1: 480.
Bas.: *Clavaria fusiformis* Sowerby 1799. Coll. Figs. Engl. Fungi 2: 98, pl. 234.
Lit.: VI: 718. - Wakefield 1922: 90.
NC: Mont Ignambi, 2000 feet, on ground in forest, VIII 1914, Compton 1652 (K).
Current name: ***Ramariopsis fusiformis*** (Sowerby) Petersen 1978. Mycologia 70: 668.

⇒*Clavaria sarasinii** Cotton in Wakef. *et al.* in Schinz 1916. Viertelj. Naturf. Ges. Zürich 61: 630.
Syn.: *Clavaria sarasinii* Cotton in Wakef. in Sarasin & Roux 1920. Nova Caledonia, 102 (diagn. superfl.).

Lit.: Not cited in Reed & Farr (1993).
LI: Lifou, on soil, leg. Sarasin & Roux 251 (holotype, no specimen in K). - NC: Nouméa, Forêt de Thi, on forest soil, 3 V 1964, leg. Huguenin NC 64-182 (K).
Current name: ***Scytinopogon angulisporus*** (Pat.) Corner 1950. Monogr. Clav., 648.

⇒***Clavaria striata*** Pers. 1797. Comm. Fung. Clavaef., 75.
Lit.: VI: 705. - Wakefield 1922: 90.
NC: Mont Canala, 1500 feet, on rotting wood in cloud forest, VI 1914, Compton 1179 (K).

Identity of taxon doubtful.

⇒*Clavariopsis pulchella* var. *lutescens** Pat. & Har. 1912. Bull. Soc. Mycol. Fr. 28: 280.
Lit.: XXIII: 582. - Wakefield 1922: 91.
NC: Bouloupari, on dead wood, leg. Le Rat 1179 (holotype, FH); Monts Koghis, Houaïlou, 1000 feet, IV, leg. Sarasin & Roux (no specimen in K).
Current name: ***Ramariopsis pulchella*** (Boud.) Corner 1950. Monogr. Clav., 645.

⇒***Coltricia cinnamomea*** (Jacq.: Pers.) Murrill 1904. Bull. Torr. Bot. Cl. 31: 343.
Bas.: *Boletus cinnamomeus* (Jacq.) Pers. 1825. Mycol. Europ. 2: 41.
Lit.: VI: 210; XXIII: 381.
NC: Monts Koghis, 300 m, on bare lateritic soil, tropical forest, 7 III 1977, leg. Horak 77-84, det. Ryvarden (ZT).

⇒*Coltriciella dependens* (Berk. & M.A. Curtis) Murrill 1904. Bull. Torr. Bot. Cl. 31: 348.
Bas.: *Polyporus dependens* Berk. & M.A. Curtis 1853. Ann. Mag. Nat. Hist., sér. 2, 12: 431.
Lit.: Not cited in Reed & Farr (1993).
NC: Col de la Pirogue, 300 m, on rotten wood, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).
Current name: ***Coltricia dependens*** (Berk. & M.A. Curtis) Imazeki 1943. Bull. Tokyo Sci. Mus. 6: 109.

⇒***Colus hirundinosus*** Cavalier & Séchier 1835. Ann. Sci. Nat. Bot., sér.3, 2: 255.
Lit.: Not cited in Reed & Farr (1993).
NC: Dotio, on sand, leg. Balansa 3679 (no specimen in PC).

⇒***Conchomyces bursaeformis*** (Berk.) E. Horak 1981b. Sydowia 34: 110.
Bas.: Agaricus bursaeformis Berk. 1860. Fl. Tasm. 2: 245.
Lit.: Not cited in Reed & Farr (1993).
NC: Païta, Mont Mou, 1100 m, on rotten wood of *Nothofagus* sp. (Fagaceae), 20 II 1977, leg. Horak 77-151 (ZT !).

⇒***Coprinus miniatofloccosus**** Bres. & Pat. 1902. - In: Lloyd, Mycol. Not. 1: 49.
Lit.: XVI: 1115, XVII: 91.
PS: Samoa, substrate and collector unknown, 5009 (holotype ?, no specimen in PC).

⇒***Coriolopsis aspera*** (Jungh.) Teng 1963. Chung-kuo Ti Chen-chun, 759.
Bas.: *Trametes aspera* Jungh. 1838. Fl. Crypt. Jav., 60.
Syn.: *Polyporus asperi* (Jungh.) Jungh. 1839. Verh. Batav. Genootsch. 17: 60.
Lit.: XXIII: 378. - Hariot & Patouillard 1903: 8. - Cited in Reed & Farr 1993: 623, as "*Polyporus asperi*".
NC: Nouméa (Magenta), on *Acacia* sp. (Mimosaceae), XII 1900, leg. Bernier 1042 (PC); Col de la Pirogue, 300 m, on rotten bark of tree, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT); Ile des Pins, IX 1901, leg. Bernier (no specimen in PC).

⇒***Coriolopsis caperata*** (Berk.) Murrill 1908. North Amer. Fl. 9: 77.
Bas.: *Polyporus caperatus* Berk. 1839. Ann. Mag. Nat. Hist., ser. 1, 3: 391.
Lit.: XXIII: 381. - Hariot & Patouillard 1903: 9. - Patouillard 1905: 523.
NC: Téné, at base of *Symplocos* sp. (Symplocaceae), leg. Le Rat 1067 (no specimen in PC); Pic Malaoui, on roots of *Ficus* sp. (Moraceae), VI 1900, leg. Bernier 910 (no specimen in PC); Col de la Pirogue, 300 m, on rotten wood, tropical forest, 20 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒*Coriolus elongatus* (Berk.) Pat. 1900. Essai Tax., 94.
Bas.: *Polyporus elongatus* Berk. 1842. Hooker's J. Bot. 1: 149.
Syn.: *Hirschioporus elongatus* (Berk.) Teng 1963. Chung-kuo Ti Chen-chun, 761.
Trametes friesii (Klotzsch) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 171.
Lit.: XXIII: 378. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 9. - Patouillard 1905: 523. - Patouillard 1906c: 50. - Wakefield in Sarasin & Roux 1920: 96. - Cunningham 1965: 171.
NC: Several localities, substrate unknown, leg. Le Rat (no specimen in PC); Tendéa, II 1900, leg. Bernier 17 (PC); Ile des Pins, substrate unknown, IX 1901, leg. Bernier 1188 (PC); Mont Panié, 1000 m, on wood in cloud forest, 28 VI 1911, leg. Sarasin & Roux 84 (K); Monts Koghis, on dead tree, 10 V 1964, leg. Huguenin NC 64-212 (K). - LI: Lifou, substrate unknown, leg. Sarasin & Roux 256 (K). - PF: Tahiti, on roots, leg. Seurat (no specimen in PC).
Current name: ***Hirschioporus friesii*** (Klotzsch) D.A. Reid 1975. Contr. Bolus Herb. 7: 59.

⇒*Coriolus lutescens* (Pers.) Quél. 1888. Fl. Mycol., 389.
Bas.: *Boletus lutescens* Pers. 1794. Neue Annlen. Bot. 5: 29.
Lit.: Patouillard 1902a: 767. - Hariot & Patouillard 1903: 9. - Not cited in Reed & Farr (1993).
NC: Locality, substrate and collector unknown (no specimen in PC); Nouméa, on dead "goyavier", VIII 1900, leg. Bernier 60 (no specimen in PC); Magenta, on living *Myoporum* sp. (Myoporaceae) , XII 1900, leg. Bernier 1043 (no specimen in PC); Néaria, III 1901, leg. Bernier 1049 (PC); Canala, Coindé, II 1901, leg. Bernier 1076 (PC).
Current name: ***Trametes hirsuta*** (Wulfen: Fr.) Pilát in Kavina & Pilát 1939. Atl. Champ. Europ. Polypo. 3: 265.

⇒*Coriolus velutinus* (Pers.) Quél. 1886. Enchiridion, 175.
Bas.: *Boletus velutinus* Pers. 1794. Neue Annlen Bot. 5: 29.
Syn.: *Polystictus velutinus* (Pers.) Cooke 1886. Grevillea 14: 83.
Lit.: Hariot & Patouillard 1903: 9. - Not cited in Reed & Farr (1993). NC: Nouméa (Magenta), on trunks of living trees, I 1900, leg. Bernier 54 (no specimen in PC).
Current name: ***Trametes velutinus*** (Pers.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 173.

⇒*Coriolus versicolor* (L.) Quélet 1886. Enchir. Fung., 175.
Bas.: *Boletus versicolor* L. 1753. Spec. Plant., 1176.
Lit.: VI: 253, XV: 68. - Patouillard 1905: 523.
NC: Farnio, on dead wood, leg. Le Rat 1061 (no specimen in PC).
Current name: ***Trametes versicolor*** (L.) Lloyd 1921. Mycol. Not. 6: 1045.

⇒*Corticium caeruleum* (Schrad.) Fr. 1838. Epicrisis, 562.
Bas.: *Thelephora caerulea* Schrad. in DC. 1815. Fl. Franç. 2: 107.
Lit.: VI: 614. - Patouillard 1887: 172. - Wakefield 1922: 90.

NC: Locality unknown, on dead wood, 1914, leg. Compton 720 (K).
Current name: ***Pulcherricium caeruleum*** (Fr.) Parmasto 1968. Conspect. Syst. Cort., 133.

⇒***Cortinarius (Myxacium) necessarius**** E. Horak 1990. Sydowia 42: 150.
NC: Païta, Mont Mou, 1200 m, on soil among mosses under *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-133 (holotype, ZT !).

⇒***Cortinarius (Myxacium) neocaledonicus**** E. Horak 1990. Sydowia 42: 136.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-156 (holotype, ZT !).

⇒***Cortinarius (Myxacium) verecundus**** E. Horak 1990. Sydowia 42: 98.
NC: Païta, Mont Mou, 1150 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-38 (holotype, ZT !).

⇒***Crepidotus aureus**** E. Horak 1977. Ber. Schweiz. Bot. Ges. 87: 230.
NC: Païta, Mont Mou, 1100 m, on rotten bark of branches and logs in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-154 (holotype, ZT).

⇒***Crepidotus hirsutellus**** E. Horak 1977. Ber. Schweiz. Bot. Ges. 87: 228.
NC: Païta, Mont Mou, 1100 m, on rotten bark of branches and logs in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-153 (holotype, ZT !).

⇒***Crepidotus mollis*** (Schaeffer:Fr.) Staude 1857. Schwämme Mitteldeutschl. 25: 71.
Bas.: Agaricus mollis Schaeffer 1774. Fung. Bavar. Palat. nasc. 4: 49.
Lit.: V: 877. - Wakefield in Sarasin & Roux 1920: 92.
NC: Oubatche, leg. Sarasin & Roux 17 (no specimen in K).

⇒***Crinipellis elatus**** Pat. 1908b. Bull. Soc. Mycol. Fr. 24: 167.
Syn.: *Marasmius elatus* (Pat.) Sacc. & Trotter 1912. Syll. Fung. XXI: 112.
NC: On fallen leaves, leg. Le Rat 4084 (holotype, FH).

⇒***Crinipellis carecomoeis*** (Berk. & M.A. Curtis) Singer var. ***subelata**** Singer 1942. Lilloa 8: 488.
NC: Col d'Amieu, on fallen leaves of evergreen tree, 1907, leg. Le Rat 97 (holotype, FH).

⇒***Crinipellis mirabilis**** Singer 1942. Lilloa 8: 497.
NC : Col d'Amieu-Mégropo, on twigs, 1907, leg. Le Rat 101 (holotype, FH).

⇒***Crinipellis stipitarius*** (Fr.) Pat. 1889. J. Bot. (Morot) 3: 336.
Bas.: *Agaricus (Collybia) stipitarius* Fr. 1821. Syst. Mycol. 1: 138.
Lit.: XXI: 115. - Hariot & Patouillard 1903: 12.
NC: Nouméa, on rotting debris of verbenaceous plants, VIII 1900, leg. Bernier 96 p.p. (PC); same locality, on debris, leg. Le Rat 1113 (PC).

⇒***Cuphocybe ferruginea**** E. Horak 1980a. Sydowia 33: 60.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-39 (holotype, ZT !).

⇒***Cyathus gayanus*** Tulasne 1844. Ann. Sci. Nat., sér. 3, 1: 76.
Lit.: VII: 53. - Hariot & Patouillard 1903: 12.
NC: Nouméa, on dung of herbivores, V 1900, leg. Bernier 70 p.p. (PC).
Identity and taxonomy uncertain.

⇒***Cyathus lesueuri*** Bory in Tulasne 1844. Ann. Sci. Nat., sér. 3, 1: 79.
Lit.: VII: 38. - Hariot & Patouillard 1903: 13.
NC: Nouméa, on dung of herbivores, V 1900, leg. Bernier 70 p.p. (PC).

⇒***Cyathus poeppigii*** Tulasne 1844. Ann. Sci. Nat. Bot, sér. 3, 1: 77.
Lit.: VII: 36. - Wakefield in Sarasin & Roux 1920: 104.
NC: Oubatche, substrate unknown, 2 IV 1911, leg. Sarasin & Roux 11 (K).

⇒***Cyathus striatus*** (Hudson) Willdenow 1787. Fl. Berol., 399.
Bas.: *Peziza striata* Hudson 1762. Fl. Angl., 634.
Lit.: VII: 33. - Müller 1887: 77. - Patouillard 1887: 174.
NC: Nouméa, dans les lieux incultes, common, 1871, Balansa 3677 (PC); locality and substrate unknown, 1870, leg. Pancher 734 (PC); Monts Koghis, substrate unknown, 1886, leg. Savès (PC).

⇒***Cyclomyces setiporus*** (Berk.) Pat. 1900. Essai Tax., 98.
Bas.: *Polyporus setiporus* Berk. 1847. Hooker's J. Bot. 6: 505.
Lit.: Not cited in Reed & Farr (1993).
NC: Païta, Mont Mou, 1200 m, on rotten bark and wood of *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒*Cyphella crateriformis** Pat. 1915. Bull. Soc. Mycol. Fr. 31: 31.
Lit.: XXIII: 544.
NC: Col d'Amieu, on fallen decomposing branches, leg. Le Rat 1915 (holotype, FH).
Current name: ***Calyptella crateriformis*** (Pat.) W.B. Cooke 1961. Beih. Sydowia 4: 35.

⇒*Cyphella grandis** Pat. 1906a. - In: Lloyd, Mycol. Writ. 2 (21): 258.
Lit.: XIX: 522, XXI: 422.
PS: Samoa, on tree bark, 1901, leg. Lloyd (holotype, FH; isotype, PC).
Current name: ***Calyptella grandis*** (Pat.) W.B. Cooke 1961. Sydowia Beih. 4: 38.

⇒***Cystoagaricus strobilomyces*** (Murrill) Singer 1947. Mycologia 39: 85.
Bas.: *Nolanea strobilomyces* Murrill 1945. Fla. Acad. Sci. 7: 118.
Lit.: Horak 1980b: 66.
NC: Païta, Mont Mou, 1200 m, on rotten wood and bark in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 I 1977, leg. Horak 77-35 (ZT !).

⇒*Dacryomitra tenuis** Wakef. in Wakef. *et al.* in Schinz 1916. Viertelj. Naturf. Ges. Zürich 61: 630.
Syn.: *Dacryomitra tenuis* Wakef. in Sarasin & Roux 1920: 103 (diagn. superfl.).
Lit.: Not cited in Reed & Farr (1993).
LI: Lifou, on wood, 1912, leg. Sarasin & Roux 1932 (holotype, K).
Current name: ***Dacryopinax spathularia*** (Schwein.) Martin 1948. Lloydia 11: 116.

⇒***Daedalea hydnopora**** Pat. 1905. Agric. Prat. Pays Chauds 5: 523.
Lit.: Not cited in Reed & Farr (1993).
NC: Koniambo, among debris on forest soil, leg. Le Rat 1066 (PC).
Identity of taxon doubtful (cf. Mycotaxon 11: 435-442. 1980).

⇒*Dictyophora bicampanulata** Mont. 1848. Ann. Sci. Nat., sér. 3, 10: 122.
Lit.: VII: 4, XII: 947.
PF: Tahiti, on moist soil, leg. Lépine (holotype, not in PC).
Current name: ***Dictyophora indusiata*** (Ventenat: Pers.) Desvaux 1809. J. Bot. (Paris) 2: 92.

⇒*Dictyophora phalloidea* Desveaux 1809. J. Bot. (Paris) 2: 92.
Lit.: VII: 3, 6. - Müller 1887: 77. - Patouillard 1906c: 52.
NC: Nouméa, substrate unknown, 1886, leg. Savès (no specimen in PC); Balade, sur la terre nue, Vieillard 1890 (PC, Herb. Nouvelle-Calédonie 1855-1860); locality, sub-

strate and date unknown, leg. Huguenin, det. Dring (K). - PF: Tahiti, on soil, leg. Seurat (no specimen in PC).
Current name: ***Dictyophora indusiata*** (Ventenat: Pers.) Desvaux 1809. J. Bot. (Paris) 2: 92.
⇒Dictyophora indusiata (Ventenat: Pers.) Desvaux 1809. J. Bot. (Paris) 2: 92.
Lit.: Sarasin & Roux 1914: 3. - Wakefield 1922: 91. - Not cited in Reed & Farr (1993).
NC: Païta, Mont Mou, on the ground in old-burnt area with *Lantana* sp. (Verbenaceae), III 1914, leg. Compton (K).
⇒Dictyophora speciosa Klotzsch in Meyen 1843. Nov. Act. Acad. Leop. Carol. 19, suppl. 1: 239.
Lit.: VII: 5. - Patouillard 1887: 173.
NC: Balade, on soil, Vieillard 1890 (PC).

⇒Entoloma aromaticum* E. Horak 1973. Nova Hedwigia Beih. 43: 52.
Lit.: Horak 1980f: 170. - Horak 1982: 14.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-127 (ZT !).
⇒Entoloma canobrunnescens* E. Horak 1980f. Nova Hedwigia Beih. 65: 188.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-53 (holotype, ZT).
⇒Entoloma extraordinarium* E. Horak 1980f. Nova Hedwigia Beih. 65: 52.
NC: Païta, Mont Mou, 1200 m, on rotting wood in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-53 (holotype, ZT !).
⇒Entoloma floccosodentatum* Corner & E. Horak 1980f. Nova Hedwigia Beih. 65: 288.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-55 (holotype, ZT !).
⇒Entoloma glaucopus* E. Horak 1980f. Nova Hedwigia Beih. 65: 255.
NC: Païta, Mont Mou, 1150 m, on soil among mosses in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II.1977, leg. Horak 77-16 (holotype, ZT !).
⇒Entoloma haastii G. Stev. 1962. Kew Bull. 16: 229.
Lit.: Horak 1980f: 276 (as "*E. nitidum*"). - Horak 1982: 16.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-19 (ZT !).
⇒Entoloma mariae G. Stev. 1962. Kew Bull. 16: 230.
Lit.: Horak 1980f: 206. - Horak 1982: 17. NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-158 (ZT !).
⇒Entoloma neocaledonicum* E. Horak 1980f. Nova Hedwigia Beih. 65: 130.
NC: Païta, Mont Mou, 1200 m, on rotten wood in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 19 II 1977, leg. Horak 77-44 (holotype, ZT !).
⇒Entoloma proprium* E. Horak 1980f. Nova Hedwigia Beih. 65: 68.
NC: Païta, Mont Mou, 1200 m, on soil or on rotten wood in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-152 (holotype, ZT !).
⇒Entoloma rotundisporum* E. Horak 1980f. Nova Hedwigia Beih. 65: 87.
NC: Païta, Mont Mou, 1100 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-138 (holotype, ZT !).
⇒Entoloma serrulatum (Fr.: Fr.) Hesler 1967. Nova Hedwigia Beih. 23: 140.

Bas.: *Agaricus serrulatus* Fr. 1818. Obs. Mycol. 2: 216.
Lit.: Horak 1980f: 298.
NC: Yaté, 35 m, on soil, coastal tropical forest, 25 II 1977, Horak 77-170 (ZT !).
⇒***Entoloma translucidum*** E. Horak 1973. Nova Hedwigia Beih. 45: 51.
Lit.: Horak 1980f: 169. - Horak 1982: 19.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-137 (ZT !).
⇒***Exidia fuliginea*** Mont. 1852. Fl. Chil. 7: 392.
Lit.: VI: 776. - Patouillard 1887: 172.
NC: Mont Humboldt, 1200 m, on bark of trees in cloud forest, 12 X 1869, leg. Balansa 2607 (PC).

Identity of taxon doubtful.

⇒*Favolus nummularius* Berk. 1842. Hooker's J. Bot. 1: 455.
Lit.: VII: 309. - Wakefield in Sarasin & Roux 1920: 99.
LI: Lifou, substrate unknown, leg. Sarasin & Roux 205 (K).
Current name: ***Filoboletus*** sp. (cf. Ryvarden 1991).
⇒*Favolus sarasinii* Wakef. in Wakef. *et al.* in Schinz 1916. Vierteli. Naturf. Ges. Zürich 61: 629.
Lit.: Wakefield in Sarasin & Roux 1920: 99. - Not cited in Reed & Farr (1993).
NC: Hienghène, on wood, VI 1911, leg. Sarasin & Roux 65 (holotype, K).
Current name: ***Campanella sarasinii*** (Wakefield) Lloyd 1924. Mycol. Writ. 7: 1275.
⇒***Favolus tesselatus*** Mont. 1843. Ann. Sci. Nat. Bot., sér. 2, 20: 365.
Syn.: *Polyporus tesselatus* Fr. 1821. Syst. Mycol. 1: 342. Lit.: VII: 393. - Hariot & Patouillard 1903: 12.
NC.: Ile des Pins, substrate unknown, IX 1901, leg. Bernier (PC).

Identity of taxon doubtful.

⇒*Favolus (Apus) transiens* Cesati 1879. Myc. Born., 8.
Lit.: VI: 402. - Patouillard 1887: 170.
NC: Canala, on tree trunks, collector unknown (no specimen in PC); Païta, Mont Mou, on tree trunks, leg. Balansa (no specimen in PC).
Current name: ***Cyclomyces setiporus*** (Berk.) Pat. 1900. Essai Tax., 98.
⇒***Filoboletus conus**** Maas Gest. & E. Horak 1995. Bibl. Mycol. 159: 213.
NC: Yaté, 60 m, on rotten log, coastal tropical forest, 15 VIII 1967, leg. Horak 67-146 (holotype, ZT !).
⇒***Filoboletus manipularis*** (Berk.) Singer 1945. Lloydia 8: 215.
Bas.: *Favolus manipularis* Berkeley 1854. Hooker's J. Bot. 6: 229.
Syn.: *Mycena manipularis* (Berk.) Métrod 1949. Les Mycènes. Fl. Mycol. Madagascar 3: 87.
Lit.: Kobayasi 1981: 423. - Corner 1954: 267.
NC: Locality and substrate unknown, leg. Corner (?).
⇒***Filoboletus pustulosus**** Maas Gest. & E. Horak 1995. Bibl. Mycol. 159: 220.
NC: Païta, Col de la Pirogue, 520 m, on rotten log, 7 III 1977, leg. Horak 77-86 (holotype, ZT !).
⇒*Flammula sapinea* (Fr.) Fr. 1821. Syst. Mycol. 1: 239.
Lit.: V: 824, XXI: 707. - Wakefield in Sarasin & Roux: 1920: 92.
NC: Mont Ignambi, substrate unknown, 1200 m, leg. Sarasin & Roux 29 (no specimen in K).

Current name: ***Gymnopilus sapineus*** (Fr.: Fr.) Maire 1933. Treb. Mus. Ci. Nat. Barcelona 15: 96.

⇒*Fomes melanoporus* (Mont.) Fr. 1851. Nov. Symb., 65.
Bas.: *Polyporus melanoporus* Mont. 1842. N. Sci. Nat. Bot. 17: 127.
Lit.: Wakefield in Sarasin & Roux 1920: 94. - Not cited in Reed & Farr (1993).
NC: Oubatche, substrate unknown, Sarasin & Roux 92 (no specimen in K).
Current name: ***Phellinus melanoporus*** (Mont.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 224.

⇒*Fomes nigricans* (Fr.) P. Karst. 1881. Rev. Mycol. (Toulouse) 3: 18.
Bas.: *Polyporus nigricans* Fr. 1821. Syst. Mycol. 1: 375.
Lit.: X: 746. - Wakefield in Sarasin & Roux 1920: 94.
NC: Mont Humboldt, 1000 m, in cloud forest, leg. Sarasin & Roux 106 (K).
Current name: ***Phellinus nigricans*** (Fr.) P. Karst. 1899. Krit. Ofvers. Finl. Basidsv., 134.

⇒*Fomes pectinatus* (Klotzsch) Fr. 1851. Nov. Symb., 66.
Bas.: *Polyporus pectinatus* Klotzsch 1833. Linnaea 8: 485.
Syn.: *Phellinus pectinatus* (Klotzsch) Quél. 1886. Enchiridion, 173.
Lit.: XXIII: 379, 381. - Patouillard 1887: 171. - Patouillard 1902a: 767. - Wakefield in Sarasin & Roux 1920: 95.
NC: Locality and collector unknown, on tree trunks (PC, 718); Mont Canala, substrate unknown, 650 m, 3 XI 1911, leg. Sarasin & Roux 121, 122 (K); Nouméa, Forêt de Thi, on living tree, 3 V 1964, leg. Huguenin NC 64-171 (K).
Current name: ***Fulvifomes pectinata*** (Klotzsch) Bondartseva & Herrera in Bondartseva et al. 1992. Mikol. Fitol. 26: 13.

⇒*Fomes rimosus* (Berk.) Fr. 1851. Nov. Symb., 66.
Bas.: *Polyporus rimosus* Berk. 1845. Hooker's J. Bot. 4: 54.
Lit.: Wakefield 1922: 88. - Not cited in Reed & Farr (1993).
NC: Port Despointes, on old stumps and dying trees of *Acacia spirorbis* (Mimosaceae), 1914, leg. Compton 144 (K).
Current name: ***Phellinus rimosus*** (Berk.) Pilát 1940. Ann. Mycol. 38: 80.

⇒*Fomes rugosus* (Blume & Nees) Fr. 1851. Nov. Symb., 66.
Bas.: *Polyporus rugosus* Blume & Nees 1826. Nova Acta Acad. Caes. Leop. 13: 21.
Lit.: Wakefield in Sarasin & Roux 1920: 95. - Cunningham 1965: 142. - Not cited in Reed & Farr (1993).
NC: Yaté, coastal tropical forest, leg. Sarasin & Roux 186 (no specimen in K); locality, substrate and collector unknown (Cunningham 1965).
Current name: ***Amauroderma rugosum*** (Blume & Nees) Torrend 1920. Broteria Bot 18: 127.

⇒*Fomes senex* (Nees & Mont.) Fr. 1851. Nov. Symb., 62.
Bas.: *Polyporus senex* Nees & Mont. 1836. Ann. Sci. Nat. Bot., sér. 2, 5: 70.
Lit.: Hariot & Patouillard 1903: 10. - Wakefield in Sarasin & Roux 1920: 95. - Not cited in Reed & Farr (1993).
NC: Pic Malaoui, on woody saxifragaceous plant, leg. Le Rat 1056 (no specimen in PC); Mont Canala, substrate unknown, 650 m, leg. Sarasin & Roux 129 (no specimen in K); Ile des Pins, substrate unknown, IX 1901, leg. Bernier 44 (no specimen in PC); Pango, on dead tree, VI 1962, Huguenin NC 64-127 (K); La Crouen, on living tree, 11 VII 1964, Huguenin NC 64-404 (K).

Current name: ***Phellinus senex*** (Nees & Mont.) Imazeki 1952. Bull. Govt. For. Exp. Stat. 57: 115.
⇒*Fomes strigatus (*Berk.) Cooke 1885. Grevillea 14: 20.
Bas.: *Polyporus strigatus* Berk. 1847. Hooker's J. Bot. 6: 502.
Lit.: XXIII: 382. - Wakefield in Sarasin & Roux 1920: 95.
NC: Oubatche, substrate unknown, leg. Sarasin & Roux 37 (no specimen in K); locality and substrate unknown, 1962, leg. Huguenin NC 64-128; Medaouya, on dead wood, 22 VII 1964, leg. Huguenin NC 65-048 (K).
Current name: ***Osmoporus strigatus*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 243.
⇒*Fomes ulmarius* (Sowerby) Gillat 1878. Hymènomyc., 683.
Bas.: *Boletus ulmarius* Sowerby 1797. Col. Figs. Engl. Fungi 1: 39, pl. 87.
Syn: *Fomes ulmarius* (Sowerby) Cooke 1885. Grevillea 13: 119 (comb. superfl.).
Lit.: Wakefield in Sarasin & Roux 1920: 95. - Not cited in Reed & Farr (1993).
NC: Mont Canala, substrate unknown, 650 m, 1911, leg. Sarasin & Roux 130 (K).
Current name: ***Leucofomes ulmarius*** (Sowerby) Kotlaba & Pouzar 1957. Ceská Mykol. 11: 157.

⇒***Gallacea avellana**** Pat. 1911. Bull. Soc. Mycol. Fr. 27: 38.
Lit.: XXIII: 597.
NC: Locality unknown, on fallen dead twigs in the forest, leg. Le Rat 1516 (holotype, FH).
⇒***Ganoderma amboinense*** (Lam.) Fr. 1838. Epicrisis, 449.
Bas.: *Agaricus amboinensis* Lam. 1783. Encycl. 1: 49.
Syn.: *Polyporus amboinensis* (Lam.) Fr. 1821. Syst. Mycol. 1: 354.
Ganoderma amboinense (Lam.) Pat. 1887. Bull. Soc. Mycol. Fr. 3: 171 (comb. superfl.).
Polyporus pisachapani Ehrenberg & Nees 1826. Nova Acta Acad. Caes. Leop. Carol. 13: 1.
Lit.: VI: 156. - Patouillard 1887: 171. - Hariot & Patouillard 1903: 10. - Patouillard 1905: 523, 524.
NC: Nouméa, on tree trunks, leg. ? (no specimen in PC); Pouéta, on dead wood, VI 1900, leg. Bernier 33 (PC); Ouinguivo, Houaïlou, substrate unknown, IV 1901, leg. Bernier 1079 (no specimen in PC); Néaria, on *Cocos nucifera* (Palmae), III 1901, leg. Bernier 1077 (no specimen in PC); Pic Malaoui, on logs and dead lianas, leg. Le Rat 1043 (no specimen in PC); Me Arembo, substrate unknown, leg. Le Rat 1051, 1052 (no specimen in PC).
⇒*Ganoderma australe* (Fr.) Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 71.
Bas.: *Polyporus australis* Fr. 1828. Elenchus Fung. 1: 108.
Lit.: XXIII: 377, 382. - Patouillard 1887: 171. - Patouillard 1889a: 71. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 10. - Patouillard 1905: 523. - Wakefield in Sarasin & Roux 1920: 93. - Wakefield 1922: 88.
NC: Nouméa, on tree trunks, collector unknown (no specimen in PC); Me Arembo, on *Monimia anisata* (Monimiaceae), leg. Le Rat 1040 (PC); Ouinguivo, IV 1901, collector unknown, 1080 (PC); Mont Panié, 1400 m, in cloud forest, leg. Sarasin & Roux (no specimen in K); Yaté, Ermitage Stream (no specimen in K). - LI: Maré, substrate unknown, leg. Sarasin & Roux 138 (no specimen in K). - For further collections cf. Hariot & Patouillard 1903: l.c.

Current name: ***Elfvingia australis*** (Fr.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 256.

⇒***Ganoderma fasciatum*** (Lév.) Pat. 1903. J. Bot. (Morot) 17: 11.
Bas.: ?.
Lit.: Hariot & Patouillard 1903: 11.
NC: Houaïlou, sommet d'Arago, substrate unknown, IV 1901, leg. Bernier 1078 (PC).
Identity of taxon doubtful.

⇒*Ganoderma insulare** Har. & Pat. 1903. J. Bot. (Morot) 17: 11.
Lit.: Patouillard 1905: 524.
NC: Nouméa, substrate and date unknown, leg. Le Rat 1119 (PC); Ile des Pins, on soil, IX 1901, leg. Pancher 3313 (holotype, FH).
Also reported from Tahiti.
Current name: ***Fomes insularis*** (Har. & Pat.) Saccardo 1905. Syll. Fung. 17: 125.

⇒***Ganoderma lingua*** (Blume in Blume & Nees) Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 70.
Bas.: *Polyporus lingua* Blume in Blume & Nees 1826. Nov. Acta Acad. Caes. Leop. Carol. 13: t. 5.
Lit.: VI: 156. - Patouillard 1905: 524.
NC: Locality unknown, interior of the island, on "geissois", leg. Le Rat 1042 (PC).

⇒***Ganoderma lucidum*** (Curtis: Fr.) P. Karst. 1881. Rev. Mycol. (Toulouse) 9: 17.
Bas.: *Boletus lucidus* Curtis 1781. Fl. Lond., 224.
Lit.: Hariot & Patouillard 1903: 10. - Patouillard 1906c: 50. - Wakefield 1922: 88.
NC: Parasitic on *Cocos nucifera* (Palmae), 1914, leg. Compton (K); Ile des Pins IX 1901, leg. Bernier (no specimen in PC). - PF: Tahiti, on root, leg. Seurat (no specimen in PC).

⇒***Ganoderma mangiferae*** (Lév.) Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 74.
Bas.: *Polyporus mangiferae* Lév. 1846. Ann. Sci. Nat. Bot., sér. 3, 5: 130.
Lit.: Wakefield in Sarasin & Roux 1920: 94. - Holotype material in PC.
NC: Oubatche, Ngoy Valley, substrate unknown, 20 IX 1911, leg. Sarasin & Roux 104 (K).

⇒*Ganoderma mastoporum* (Lév.) Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 71.
Bas.: *Polyporus mastoporus* Lév. 1844. Ann. Sci. Nat. Bot., sér. 3, 2: 182.
Lit.: Wakefield in Sarasin & Roux 1920: 94. - Holotype material in PC .
NC: Yaté, III 1912, leg. Sarasin 197 (holotype of *G. sarasinii,* K); Oubatche, 2 IV 1911, Sarasin 9 (K); Canala, substrate unknown, leg. Sarasin & Roux (K). - LI: Lifou, leg. Sarasin & Roux (K).
Current name: ***Ganoderma sarasinii*** Steyaert 1961. Bull. Jard. Bot. Belg. Brux. 31: 80.

⇒*Ganoderma rugosum* (Blume & Nees) Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 68.
Bas.: *Polyporus rugosus* Blume & Nees 1826. Nov. Acta Acad. Caes. Leop. Carol. 13: 21.
Lit.: Hariot & Patouillard 1903: 10. - Patouillard 1905: 524. - Not cited in Reed & Farr (1993).
NC: La Foa, substrate unknown, VI 1900, leg. Bernier 33 (PC); Pic Maloui, on roots, leg. Le Rat 1085 (PC); Me Arembo, substrate unknown, leg. Le Rat (no specimen in PC).
Current name: ***Amauroderma rugosum*** (Blume & Nees) Torrend 1920. Broteria Bot. 18: 127.

⇒*Ganoderma subrugosum** Bres. & Pat. in Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 77.

Syn.: *Fomes subrugosum* (Bres. & Pat.) Sacc. 1891. Syll. Fung. IX: 177.
Lit.: XV: 148.
PS: Samoa, substrate unknown, leg. Weber (holotype lost ?, B).
Current name: ***Amauroderma subrugosum*** (Bres. & Pat.) Torrend 1920. Broteria Bot. 18: 128.

⇒***Gastroboletus doii**** Zang 1995. Mycotaxon 64: 408.
NC: Païta, Mont Mou, 1100 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 21 II 1992, leg. Doi, F-171953 (holotype, TNS).

⇒*Geastrum biplicatum* Berk. & M.A. Curtis 1860. Proc. Amer. Acad. Arts Sci. 4: 124.
Lit.: VII: 76. - Hariot & Patouillard 1903: 13.
NC: Nouméa, on soil, VIII 1900, leg. Bernier 72 (no specimen in PC).
Current name: ***Geastrum pectinatum*** Pers. 1801. Syn. Meth. Fung., 132.

⇒*Geastrum lloydii** Bres. & Pat. 1901. - In: Lloyd, Mycol. Not. 1: 50.
Lit.: XVI: 1117, XVII: 226.
PS: Samoa, substrate and collector unknown, 1593 (holotype, FH).
Current name: ***Geastrum velutinum*** (Morgan) Fischer 1933. Nat. Pflanzenfam. 7a: 73.

⇒*Geastrum lugubre* Kalchbr. 1884. Ertek. Teresmes. Köréböl. 13: 10.
Lit.: VII: 89. - Hariot & Patouillard 1903: 13.
NC: Locality unknown, on soil under *Lantana* sp. (Verbenaceae) and *Melaleuca* sp. (Myrtaceae), VIII 1900, leg. Bernier 73 p.p. (no specimen in PC).
Current name: ***Geastrum recolligens*** (Sowerby) Desveaux 1809. J. Bot. (Paris) 1: 102.

⇒***Geastrum saccatum*** Fr. 1829. Syst. Mycol. 3: 16.
Lit.: VII: 85, 87. - Wakefield in Sarasin & Roux 1920: 104.
LI: Lifou, substrate unknown, leg. Sarasin & Roux 218 (p.p.), 243 (no specimen in K).

⇒*Geastrum striatum* DC. var. *minor* Fr. 1829. Syst. Mycol. 3: 13.
Lit.: VII: 78, XV: 148. - Patouillard 1887: 174.
NC: Locality and substrate unknown, leg. Balansa 3678 (no specimen in PC).
Current name: ***Geastrum pectinatum*** Pers. 1801. Syn. Meth. Fung., 132.

⇒*Geastrum umbilicatum* Fr. 1829. Syst. Mycol. 3: 14.
Lit.: VII: 75. - Hariot & Patouillard 1903: 13.
NC: Locality unknown, on soil under *Lantana* sp. (Verbenaceae) and *Melaleuca* sp. (Myrtaceae), VIII 1900, leg. Bernier 73 p.p. (no specimen in PC).
Current name: ***Geastrum badium*** Pers. 1809. J. Bot. (Paris) 2: 27.

⇒***Geastrum velutinum*** Morgan 1895. J. Cinc. Soc. Nat. Hist. 18: 38.
Lit.: XI: xiii. - Wakefield in Sarasin & Roux 1920: 105.
NC: Hienghène, leg. Sarasin & Roux 64 (no specimen in K). - LI: Lifou, leg. Sarasin & Roux 218 p.p. (no specimen in K).

⇒*Gloeophyllum striatum* (Swartz) Murrill 1905. Bull. Torr. Bot. Cl. 32: 370.
Bas.: *Agaricus striatus* Swartz 1788. Prodr., 148.
Lit.: V: 643.
NC: La Foa, Ouano, on rotten bark and wood of mangrove, 5 III 1977, leg. Horak, det. Ryvarden (ZT).
Current name: ***Gloeophyllum trabeum*** (Pers.) Murrill 1908. North Amer. Fl. 9: 129.

⇒***Gloiocephala epiphylla*** Massee 1892. Grevillea 21: 34.
Lit.: XI: 142. - Horak & Desjardin 1994: 158.
NC: Nouméa, Monts Koghis, on rotting leaves and debris of palm, 23 II 1977, leg. Horak 77-165 (CANB, ZT !).

⇒*Guepinia spathularia* (Schwein.) Fr. 1828. Elenchus Fung. 2: 32.

Bas.: *Merulius spathularia* Schwein. 1822. Syn. Fung. Carol. 1: 92.
Lit.: VI: 807. - Patouillard 1906c: 47. - Wakefield in Sarasin & Roux 1920: 103, Wakefield 1922: 90.
NC: Oubatche, substrate unknown, leg. Sarasin & Roux 83 (K); Koindé, leg. Sarasin & Roux 169 (K); Païta, Mont Mou, in cloud forest, III 1914, leg. Compton 706 (K). - LI: Lifou, leg. Sarasin & Roux 213 (K). - PF: Tahiti, on dead wood, leg. Seurat (PC).
Current name: ***Dacryopinax spathularia*** (Schwein.) Martin 1948. Lloydia 11: 116.
⇒*Guepiniopsis fissa* (Berk.) Pat. 1889. Tab. Anal. Fung. 2: 70.
Bas.: *Guepinia fissa* Berk. 1843. Ann. Mag. Nat. Hist., ser. 1, 10: 383.
Lit.: VI: 811. - Hariot & Patouillard 1903: 6.
NC: Yahoué, Mont Malaoui, on rotten wood, VI 1900, leg. Bernier 90 (no specimen in PC).
Current name: ***Dacryopinax spathularia*** (Schwein.) Martin 1948. Lloydia 11: 116.

⇒***Heliomyces ? brevipes*** Mont. 1848. Ann. Sci. Nat., sér. 3, 10: 118.
Lit.: V: 571.
PF: Tahiti, on dead wood, leg. Lépine (no specimen in PC).
⇒***Heterochaete léveilléi**** Pat. 1894. Bull. Soc. Mycol. Fr. 10: 76.
Syn.: *Hydnum niveum* Pers. (1801) in Zollinger 1845-1846. Syst. Verz. Java, 123 (1078A).
Lit.: Patouillard 1906c: 47. - Not cited in Reed & Farr (1993).
PF: Tahiti, on dead branches, leg. Seurat 1113 (holotype, FH, PC).
⇒***Hexagonia amplexens**** Pat. 1902b. Bull. Soc. Mycol. Fr. 18: 299.
Lit.: XVII: 138, XIX: 866, XX: 1250.
NC: Locality and collector unknown, on dead branches of an *Acacia* sp. (Mimosaceae), 2676 (holotype, FH).
⇒***Hexagonia casuarinae**** Pat. 1901. Agric. Prat. Pays Chauds 1: 263.
Lit.: XVII: 138, XIX: 866.
NC: Locality and collector unknown, on *Casuarina equisetifolia* (Casuarinaceae), 2682 (holotype, FH).
⇒***Hexagonia kurzii*** Currey 1876. Trans. Linn. Soc. London, ser. 2, 1: 126.
Lit.: VI: 360. - Wakefield in Sarasin & Roux 1920: 98.
LI: Lifou, substrate unknown, 21 IV 1912, leg. Sarasin & Roux 247 (K).
⇒***Hexagonia nigrocincta**** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 48.
Lit.: XXI: 346.
PF: Iles Gambier, Rikitea, on tree trunks, leg. Seurat 2703 (holotype, FH).
⇒*Hexagonia polygramma* Mont. in Fr. 1838. Epicrisis, 497.
Lit.: VI: 367. - Patouillard 1887: 171. - Hariot & Patouillard 1903: 8. - Wakefield in Sarasin & Roux 1920: 98. - Cunningham 1965: 184.
NC: Tendéa, on rotten wood of *Casuarina nodiflora* (Casuarinaceae), VII 1900, leg. Bernier 39 (PC); Oubatche, substrate unknown, 22 IV 1911, leg. Sarasin & Roux 33 (K); La Crouen, on *Aleurites molluccana*, 11 VII 1964, leg. Huguenin NC 64-423 (K); same locality, on dead wood, 12-13 VII 1964, leg. Huguenin NC 64-411, 64-424, 64-427, 65-049 (K); Thi-Houaïlou, on *Casuarina* sp. (Casuarinaceae), 22 VII 1964, leg. Hugueniin NC 65-014 (K); Ile des Pins, IX 1901, leg. Bernier 1125 (PC); same locality, on dead wood, 12 XII 1963, leg. Huguenin NC 63-205 (K). - LI: Lifou, Maré, substrate unknown, leg. Sarasin & Roux 135 (K).

Current name: ***Pseudofavolus polygrammus*** (Mont.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 184.

⇒*Hexagonia rigida* Berk. 1878. J. Linn. Soc. Bot. 16: 54.
Syn.: ? *Coriolopsis rigida* (Berk. & Mont.) Murrill 1908. North Amer. Fl. 9: 75.
Lit.: VI: 364. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 8. - Wakefield in Sarasin & Roux 1920: 99.
NC: Pouéta, on living *Cupania* sp. (Sapindaceae), VI 1900, leg. Bernier 40 (no specimen in PC); Tchalabel Valley, substrate unknown, leg. Sarasin & Roux 45 (no specimen in K). - LI: Maré, substrate unknown, leg. Sarasin & Roux 148 (no specimen in K).
Current name: ***Pseudofavolus polygrammus*** (Mont.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 184.

⇒***Hexagonia seurati**** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 48.
Lit.: XI: 346, XX: 1251, XXI: 346; XXIII: 447, 453 (fide Bresadola).
PF: Iles Gambier, Rikitea, on tree trunks, leg. Seurat 2718 (holotype, FH).

⇒*Hexagonia tenuis* (Hook.) Fr. 1838. Epicrisis, 498.
Bas.: *Boletus tenuis* Hook. in Kunth 1822. Syn. Pl. 1: 10.
Lit.: Not cited in Reed & Farr (1993).
NC: Col de la Pirogue, 300 m, on rotten wood, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).
Current name: ***Pseudofavolus tenuis*** (Hook.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 185.

⇒***Hexagonia tenuis*** Hook. f. ***nana**** Pat. 1902a. Agric. Prat. Pays Chauds 1: 767.
Lit.: Not cited in Reed & Farr (1993).
NC: On dead branches of *Acacia* sp. (Mimosaceae), leg. Dybowski (no specimen in PC).

⇒*Hirneola polytricha* (Mont.) Fr. 1848. Fung. Nat., 146.
Bas.: *Exidia (Auricularia) polytricha* Mont. in Bélanger 1834. Voy. Indes Orient. 2: 154.
Lit.: XV: 141. - Patouillard 1887: 171. - Patouillard 1905: 522. - Patouillard 1906c: 45. - Wakefield in Sarasin & Roux 1920: 102. - Wakefield 1922: 90.
NC: Païta, Mont Mou, on rotten tree trunks, about 400 m, IV 1870, leg. Balansa 2956 (PC); Bourail, leg. Le Rat 1046 (no specimen in PC); Nouméa, Magenta, sur les "Palétuviers morts", VIII 1900, Bernier 55 (PC); several localities, leg. Sarasin & Roux (K); Ermitage Stream, substrate unknown, I 1914, leg. Compton 218 (K); Baie Ouémo, on dying branches of *Ficus* sp. (Moraceae), I 1914, leg. Compton 235 (K).
LI: Maré and Lifou, substrate unknown, leg. Sarasin & Roux (no specimen in K). - PF: Locality and subtrate unknown, leg. Seurat (PC).
Current name: ***Auricularia polytricha*** (Mont.) Saccardo 1885. Att. Inst. Ven. 6, 3: 722.

⇒***Hydnum crocidens*** Cooke var. ***subexcentricum**** Pat. 1908a. Bull. Soc. Mycol. Fr. 24: 8.
Lit.: XXI: 365.
NC: Pic Malaoui, on tree trunks, leg. Le Rat 3571 (holotype, FH).

⇒***Hymenochaete corticolor*** Berk. & Rav. 1873. Grevillea 1: 165..
Lit.: VI: 595. - Patouillard 1906c: 50.
PF: Tahiti, on fallen branches, leg. Seurat (no specimen in PC).

⇒***Hymenochaete perpusilla**** Pat. 1887. Bull. Soc. Mycol. Fr. 3: 172.
Lit.: VI: 600, IX: 228, XII: 321.

NC: Locality, substrate and date unknown, leg. Pancher 1870 (holotype, PC); Nouméa, on dead wood, leg. Balansa 3034 (PC).
⇒***Hymenochaete sallei*** Berk. & M.A. Curtis 1868. J. Linn. Soc. Bot. 10: 333.
Lit.: Wakefield in Sarasin & Roux 1920: 101. - Not cited in Reed & Farr (1993).
LI: Lifou, substrate unknown, leg. Sarasin & Roux 258 (no specimen in K).
⇒***Hymenochaete villosa*** (Lév.) Bres. 1910. Ann. Mycol. 8: 588.
Bas.: *Stereum villosum* Lév. 1844. Ann. Sci. Nat., 2 sér., 3: 212.
Lit.: Not cited in Reed & Farr (1993). - Holotype material in PC.
NC: Col de la Pirogue, 300 m, on rotten bark, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).
⇒***Hysterangium neocaledonicum**** Pat. 1915. Bull. Soc. Mycol. Fr. 31: 34.
Lit.: XXIII: 598.
NC: Locality unknown, on soil in forest, leg. Le Rat 1480 (holotype, FH).
⇒*Irpex flavus* Klotzsch 1833. Linnaea 8: 488.
Syn.: *Polyporus flavus* (Klotzsch) Jungh. 1838. Fl. Crypt. Jav., 46.
Lit.: VI: 486. - Wakefield in Sarasin & Roux 1920: 100.
LI: Lifou, substrate unknown, leg. Sarasin & Roux (K).
Current name: ***Flavodon flavus*** (Klotzsch) Ryvarden 1973. Norw. J. Bot. 20: 3.

⇒*Isaria (Clavaria) farinosa* Fr. 1821. Syst. Mycol. 3: 271.
Bas.: *Ramaria farinosa* Holmsk. 1781. Nova Acta Dan. 1: 299.
Lit.: II: 572; VI: 584. - Patouillard 1905: 522. - de Hoog 1972.
NC: Houaïlou, on soil, leg. Le Rat 1093 (PC).
Doubtful taxon (de Hoog, 1972), considered to represent a taxon of *Isaria* (Corner, 1970: 289).

⇒***Lachnocladium neglectum**** Massee in Wakef. *et al.* in Schinz 1916. Viertelj. Naturf. Ges. Zürich 61: 630.
Syn.: *Lachnocladium neglectum* Massee in Wakef. in Sarasin & Roux 1920. Nova Caledonia, 102 (diagn. superfl.).
Lit.: Not cited in Reed & Farr (1993).
NC: La Foa, substrate unknown, 16 I 1912, leg. Sarasin & Roux 173 (holotype, K).
⇒*Laschia caespitosa* (Berk.) Berk. & Broome 1873. J. Linn. Soc. Bot. 14: 58.
Bas.: *Favolus caespitosus* Berk. 1872. J. Linn. Soc. Bot. 13: 167.
Lit.: VI: 407. - Wakefield in Sarasin & Roux 1920: 99. - Wakefield 1922: 89.
NC: Tchalabel Valley, substrate unknown, 4 V 1911, leg. Sarasin & Roux 41 (K); Ermitage Stream, substrate unknown, I, leg. Compton 192 (K). - LI: Lifou, substrate unknown, IV 1912, leg. Sarasin & Roux 234 (K).
Current name: ***Filoboletus manipularis*** (Berk.) Singer 1945. Lloydia 8: 215.
⇒*Laschia celebensis* Pat. 1887d. J. Bot. (Morot) 4: 227.
Lit.: VI: 404. - Patouillard 1906c: 51.
PF: Tahiti, on roots of bamboo, leg. Seurat (holotype, PC).
Current name: ***Favolaschia celebensis*** (Pat.) Kuntze 1898. Rev. Gen. Pl. 3: 476.
⇒***Laschia cuticularis*** (Lév.). Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 51.
Bas.: *Merulius cuticularis* Lév. in Zollinger 1854. Syst. Verz. Ind. Arch., 17.
Lit.: VI: 418. - Patouillard 1906c: 51.
PF: Tahiti, on roots of bamboo, leg. Seurat (no specimen in PC).
Identity doubtful. Belongs probably to *Favolaschia.*

⇒*Laschia tremellosa* Fr. 1846-1849. Summ. Veg. Scand., 325.
Lit.: VI: 407. - Wakefield in Sarasin & Roux 1920: 100.
NC: Mont Canala, 650 m, leg. Sarasin & Roux 123 (no specimen in K).
Current name: ***Auricularia delicata*** P. Henn. 1893. Engler's Bot. Jahrb. 17: 492.
⇒*Lentinus abnormis* Berk. 1878. J. Linn. Soc. Bot. 16: 45.
Lit.: V: 577. - Wakefield in Sarasin & Roux 1920: 91. - Pegler 1983: 200.
NC: Yaté, on rotten wood, coastal tropical forest, leg. Sarasin & Roux 194 (no specimen in K).
Current name: ***Lentinus connatus*** Berk. 1842. Hooker's J. Bot. 1: 145.
⇒***Lentinus araucariae**** Har. & Pat. 1903. J. Bot. (Morot) 17: 11.
Lit.: XVII: 49. - Pegler 1983: 62.
NC: La Foa, Tendéa, on trunk of *Araucaria* sp. (Araucariaceae), II 1900, leg. Bernier 19 (holotype, FH).
⇒*Lentinus braccatus* Lév. in Zollinger 1854. Syst. Verz., 17.
Lit.: V: 613. - Hariot & Patouillard 1903: 12. - Patouillard 1905: 525. - Pegler 1983: 157.
NC: Prony, on *Araucaria cookei* (Araucariaceae), leg. Le Rat 7 (no specimen in PC); Locality and substrate unknown, 1870, leg. Pancher (PC); Ile des Pins, substrate unknown, IX 1901, leg. Bernier (PC).
Current name: ***Lentinus ciliatus*** Lév. 1844. Ann. Sci. Nat. Bot., sér. 3, 2: 175.
⇒*Lentinus dactyliophorus* Lév. 1844. Ann. Aci. Nat., sér. 3, 2: 174.
Lit.: V: 602. - Hariot & Patouillard 1903: 12. - Wakefield in Sarasin & Roux 1920: 91. - Pegler 1983: 81.
NC: Bourail, Kourie, on dead wood, XI 1900, leg. Bernier 1049 (PC). - LI: Lifou, substrate unknown, 1911-1912, leg. Sarasin & Roux (K).
Current name: ***Lentinus sajor-caju*** (Fr.) Fr. 1838. Epicrisis, 393.
⇒*Lentinus echinopus* Lév. 1846. Ann. Sci. Nat., sér. 3, 5: 118.
Lit.: V: 579. - Patouillard 1902a: 767.
NC: cf. *L. braccatus* (cf. Pegler 1983: 157).
Current name: ***Lentinus ciliatus*** Lév. 1844. Ann. Sci. Nat. Bot., sér. 3, 2: 175.
⇒*Lentinus eradicatus** Pat. 1901. Agric. Prat. Pays Chauds 1: 264.
Lit.: XVII: 49. - Pegler 1983: 200.
NC: Locality and collector unknown, on dead trunks, 3853 (holotype, FH).
Current name: ***Lentinus connatus*** Berk. 1842. Hooker's J. Bot. 1: 145.
⇒*Lentinus exilis* Klotzsch ex Fr. 1836. Syn. Gen. Lentin., 10.
Lit.: V: 606. - Wakefield in Sarasin & Roux 1920: 91. - Pegler 1983: 81.
LI: Lifou, substrate unknown, 1911-1912, Sarasin & Roux 136 (no specimen in K).
Current name: ***Lentinus sajor-caju*** (Fr.) Fr. 1838. Epicrisis, 393.
⇒***Lentinus fasciatus*** Berk. 1840. Hooker's J. Bot. 2: 146.
Lit.: Pegler 1983: 165.
NC: Locality and substrate unknown, 1872, leg. Pancher (K); La Crouen, substrate unknown, 2 VI 1964, leg. Huguenin NC 64-292; Houaïlou, substrate unknown, 24 VII 1964, leg. Huguenin NC 65-022.
⇒*Lentinus hyracinus* Kalchbr. 1880. Grevillea 8: 153.
Lit.: V: 608. - Wakefield in Sarasin & Roux 1920: 91.
LI: Lifou, Sarasin & Roux 235 (K).
Current name: ***Lentinellus ursinus*** (Fr.) Kühner 1926. Contrib. Hymèn. Agar., 99.
⇒***Lentinus polychrous*** Lév. 1844. Ann. Sci. Nat. Bot., sér. 3, 2: 175.

Lit.: V: 590. - Patouillard 1905: 525.
NC: Locality unknown, on rotten wood, leg. Le Rat 1055 (no specimen in PC).
⇒*Lentinus radicosus** Pat. 1901. Agric. Prat. Pays Chauds 1: 264.
Lit.: XVII: 48, XIX: 1064. - Patouillard 1905: 525. - Pegler 1983: 198. NC: Locality unknown, X 1900, leg. Bernier 1038 (holotype, PC); locality and collector unknown, on dead trunks in iron-rich soil, 3885 (FH); Me Arembo, Pont des Français, on soil, leg. Le Rat 1053 (PC).
Current name: ***Lentinus fusipes*** Cooke & Massee 1887. Grevillea 16: 1.
⇒*Lentinus revelatus* Berk. 1847. Hooker's J. Bot. 6: 492.
Lit.: V: 592. - Wakefield in Sarasin & Roux 1920: 91. - Pegler 1983: 200.
LI: Lifou, substrate unknown, 1911, Sarasin & Roux (K).
Current name: ***Lentinus connatus*** Berk. 1842. Hooker's J. Bot. 1: 145.
⇒*Lentinus setiger* Lév. 1844. Ann. Sci. Nat. Bot., sér. 3, 2: 175.
Lit.: V: 578. - Patouillard 1887: 168.
NC: Locality and substrate unknown, 1870, leg. Pancher 726 bis (PC).
Current name: ***Lentinus ciliatus*** Lév. 1844. Ann. Sci. Nat. Bot., sér. 3, 2: 175.
⇒***Lentinus squarrosulus*** Mont. 1842, Ann. Sci. Nat. Bot., sér. 2, 18: 21.
Lit.: Pegler 1983: 69.
LI: Lifou, substrate unknown, 5 XI 1964, leg. Huguenin NC 65-017 (K).
⇒***Lentinus striatulus*** Lév. 1846. Ann. Sci. Nat. Bot., sér. 3, 5: 120.
Lit.: V: 610. - Patouillard 1887: 168. - Pegler 1983: 91.
NC: Ile des Pins, on rotten log, leg. Pancher 727 (no specimen in PC).
⇒*Lenzites applanata* (Pers.) Fr. 1838. Epicrisis, 404.
Bas.: *Boletus applanatus* Pers. 1799. Obs. Mycol. 2: 2.
Lit.: VI: 176. - Patouillard 1887: 168. - Patouillard 1902a: 767. NC: Locality, substrate and collector unknown, 725 (PC). - Iles Viti, 1875, leg. Filhol (PC).
Current name: ***Ganoderma applanatum*** (Pers.) Pat. 1889. Bull. Soc. Mycol. Fr. 5: 67.
⇒*Lenzites aspera* (Klotzsch) Fr. 1838. Epicrisis, 405.
Lit.: Hariot & Patouillard 1903: 8. - Patouillard 1905: 522. - Not cited in Reed & Farr (1993). NC: Nouméa, 1910, Le Rat (PC); Locality, substrate and date unknown, Vieillard (PC). - Ile des Pins, substrate unknown, IX 1901, leg. Bernier (PC); Me-Arembo, on dead wood, leg. Le Rat 1060 (PC).
Current name: ***Daedalea aspera*** Klotzsch 1833. Linnaea 8: 480.
⇒*Lenzites elegans* (Spreng.) Pat. 1900. Essai Tax., 89.
Bas.: *Daedalea elegans* Spreng. 1820. S. Vetensk. Akad. Handl., 51.
Lit.: VI: 335. - Hariot & Patouillard 1903: 8.
NC: Tendéa, on rotten wood of *Aleurites moluccana* (Euphorbiaceae), I 1900, leg. Bernier 29 (PC); Col de la Pirogue, 300 m, on rotten wood, tropical forest, 20 II 1977, leg. Horak, det. Ryvarden (ZT); Ile des Pins, IX 1901, leg. Bernier (no specimen in PC).
Current name: ***Trametes elegans*** (Spreng.) Fr. 1838. Epicrisis, 492.
⇒***Lenzites marginata**** Pat. 1887. Bull. Soc. Mycol. Fr. 3: 169.
Lit.: IX: 80; XII: 367.
NC: Locality, substrate unknown, Vieillard 2637 (holotype, FH).
⇒*Lenzites (Daedalea) palisotii* Fr. 1821. Syst. Mycol. 1: 335.
NC: La Crouen, on *Coffea robusta* (Rubiaceae), 2 VI 1964, leg. Huguenin NC 64-303 (K).
Current name: ***Lenzites elegans*** (Fr.) Pat. 1900. Essai Tax., 89.

⇒***Lenzites platyphylla*** Lév. 1844. Ann. Sci. Nat., sér. 3, 2: 179.
Lit.: V: 645. - Patouillard 1887: 169. - Hariot & Patouillard 1903: 8.
NC: Bourail, substrate unknown, collector unknown (no specimen in PC); Pouétou, on dead wood, I 1900, leg. Bernier 38 (PC).

⇒*Lenzites repanda* (Pers.) Fr. 1838. Epicrisis, 404.
Bas.: *Daedalea repanda* Pers. in Gaudichaud 1827. Voy. Uranie Bot., 168.
Lit.: V: 650. - Patouillard 1905: 522. - Wakefield in Sarasin & Roux 1920: 92.
NC: Poro, on *Myoporum* sp. (Myoporaceae), leg. Le Rat 1083 (no specimen in PC); Yaté, on rotten wood in coastal tropical forest, Sarasin & Roux 184 (no specimen in K).
Current name: ***Lenzites elegans*** (Fr.) Pat. 1900. Essai Tax., 89.

⇒*Lepiota asprata* Berk. 1847. Hooker's J. Bot. 6: 481.
Lit.: V: 480. - Wakefield in Sarasin & Roux 1920: 90.
NC: Yaté, on rotten wood in coastal tropical forest, leg. Sarasin & Roux (no specimen in K).
Current name: ***Cyptotrama asprata*** (Berk.) Redhead & Ginns 1980. Can. J. Bot. 58: 735.

⇒***Lepiota atrata**** E. Horak 1980e. Sydowia 33: 140.
NC: Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-149 (holotype, ZT !).

⇒*Leptoporus adustus* (Willdenow) Quél. 1888. Fl. Mycol., 388.
Bas.: *Boletus adustus* Willdenow 1787. Fl. Berol. Prodr., 392.
Lit.: VI: 125. - Hariot & Patouillard 1903: 8.
NC: La Foa, Farino, on rotten wood, I 1900, leg. Bernier 48 (PC).
Current name: ***Bjerkandera adusta*** (Willdenow) P. Karst. 1879. Medd. Soc. Fauna Fl. fenn. 5: 38.

⇒***Leratia atrovirens**** Heim 1968b. Rev. Mycol. 33: 212.
Syn.: *Leratia atrovirens* Heim 1968a. Rev. Mycol. 33:143. (nom. inval.).
NC: Nouméa, Forêt de Thi, on decaying leaves, leg. Veillon (holotype, PC !, FH !); Forêt de Saint-Louis, leg. Huguenin, det. Heim (PC); Païta, Col de la Pirogues, 300 m, on rotten wood, 19 II 1977, leg. Horak 77-6 (ZT !); same locality, 20 II 1977, leg. Horak 77-144 (ZT !).

⇒***Leratia coccinea**** Massee & Wakef. in Wakef. *et al.* in Schinz 1916. Viertelj. Naturf. Ges. Zürich 61: 631. Syn.: *Leratia coccinea** Massee & Wakef. in Sarasin & Roux 1920: 104. (diagn. lat. superfl.).
Lit.: Heim 1968a: 145.
LI: Lifou, IV 1912, leg. Sarasin & Roux 248 (holotype, K !).

⇒***Leratia similis**** Pat. 1907. Bull. Soc. Mycol. Fr. 23: 52.
Lit: XIX: 1119, XXI: 468. - Wakefield 1922: 91. - Heim 1967a: 12. - Heim 1968a: 139.
NC: La Foa, on soil, leg. Le Rat 1325 (holotype, FH !); Mont Ignambi, 3500 feet, on dead wood in cloud forest, VIII 1914, leg. Compton 1628 (K !); Nouméa, substrate and date unkown, leg. Huguenin (K); Nouméa, Monts Koghis, VIII 1909, leg. Le Rat 66 (FH !); Païta, between Mont Mou and Mont Dzumac, in cloud forest dominated by *Nothofagus* spp. (Fagaceae), VII 1907, leg. Le Rat 88 (FH !); Yaté, sur bois, 23 III 1949, leg. & det. Heim (PC); Païta, Mont Mou, 1200 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), VI 1906, leg. Le Rat 20 (FH !); same locality, VIII 1967, leg. McKee, det. Heim (PC); same locality, 10 II 1977, leg. Horak 77-76 (ZT !); Col de la Pirogue, 19 II 1977, leg. Horak 77-2 (ZT !); Mont Humboldt, 1500-

1600 m, in cloud forest, 23 IX 1951, leg. Baumann-Bodenheim in Horak 70-334 (ZT !); locality unknown, 14 VIII 1951, leg. Baumann-Bodenheim 15167 (ZT !). - Additional specimens in PC.

⇒***Leratia smaragdina**** Pat. 1909. Bull. Soc. Mycol. Fr. 25: 133.
Lit.: XIX: 1119, XXI: 468. - Wakefield in Sarasin & Roux 1920: 104. - Wakefield 1922: 91. - Heim 1967a: 12. - Heim 1968a: 141.
NC: Mont Dzumac, on trunk of rotten trees, IV 1908, leg. Le Rat 108 (holotype, FH !); Mont Panié, substrate unknown, 500 m, leg. Sarasin & Roux (K); Koindé and Boréraré, leg. Sarasin & Roux (K); Ermitage Stream, substrate unknown, I 1914, leg. Compton 190 (K); same locality, substrate and date unknown, Herb. Bucholtz (FH !); Tonine (2000 feet), substrate unknown, IX 1914, leg. Compton 1952 (K); Dent de St. Vincent, VII 1909, leg. Le Rat 229 (FH !); Païta, Mont Mou, 1220 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), VII 1909, leg. Le Rat 208 (FH !); same locality, substrate unknown, III 1914, leg. Compton 709 (K); same locality, 1100 m, 20 II 1977, leg. Horak 77-145, 77-146 (ZT !); Forêt de la Rivière Bleue, 26 XI 1963, leg. Huguenin, det. Heim (PC); same locality, 8 III 1966, leg. Huguenin, det. Heim (PC); Locality and substrate unknown, 1911-1912, leg. Sarasin 70, 160, 177 (K). - Additional specimens in PC.

⇒***Leucocoprinus cepaestipes*** (Sowerby) Pat. 1889. Tab. Analyt. Fung. 7: 45.
Bas.: *Agaricus cepaestipes* Sowerby 1796. Col. Fig. Eng. Fung. 1: pl. 2.
Lit.: Hariot & Patouillard 1903: 12.
NC: Néaria, on sandy soil on beach, IV 1901, leg. Bernier 1110 (no specimen in PC).

⇒*Leucoporus agariceus* (Berk.) Pat. 1900. Essai Tax., 82.
Bas.: *Polyporus agariceus* Berk. 1842. Ann. Nat. Hist. 1, 10: 371.
Lit.: Hariot & Patouillard 1903: 8.
NC: Ile des Pins, substrate unknown, IX 1901, leg. Bernier (no specimen in PC).
.Current name: ***Polyporellus agariceus*** (Berk.) Pilât 1936. Beih. Bot. Cbl. 56: 29.

⇒*Leucoporus asperulus** Pat. 1903. J. Bot. (Morot) 17: 7.
Lit.: XXIII: 376.
Syn.: *Leptoporus asperulus* (Pat.) Pat. 1907. Bull. Soc. Mycol. Fr. 23: 82.
NC: La Foa, Tendéa, on dead trunk of *Aleuritis* sp. (Euphorbiaceae), I 1901, leg. Bernier 2455 (holotype, FH).
Current name: ***Polyporus asperulus*** (Pat.) Sacc. & Trotter 1912. Syll. Fung. XXI: 268.

⇒*Leucoporus rasipes* (Berk.) Patouillard (?)
Bas.: *Polyporus rasipes* Berk. 1878. J. Linn. Soc. Bot. 16: 49.
Lit.: XXIII: 381. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 7.
NC: Locality, substrate and collector unknown (no specimen in PC); Tendéa, on dead "bancoulier" (Rhizophoraceae), I 1900, leg. Bernier 47 p.p. (no specimen in PC).
Current name: ***Tyromyces rasipes*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 123.

⇒***Loweoporus roseoalbus*** (Jungh.) Ryvarden in Ryvarden & Johansen 1980. Prel. Polyp. Fl. East Africa, 415.
Bas.: *Polyporus roseoalbus* Jungh. 1838. Verh. Batav. Genootsch. 17: 43.
Lit.: XXIII: 377, 378, 380.
NC: Col de la Pirogue, 300 m, on rotten bark of tree, tropical forest, 19 II 1977, leg. Horak 77-72, det. Ryvarden (ZT).

⇒***Lycogalopsis solmsii*** Fischer 1886. Ber. Deutsch. Bot. Ges. 4: 192.
Lit.: VII: 153. - Wakefield in Sarasin & Roux 1920: 105.

NC: Yaté, coastal tropical forest, leg. Sarasin & Roux 188 (K); same locality, 50 m, on rotten wood, coastal tropical forest, 26 II 1977, leg. Horak 77-214 (ZT).

⇒*Lycoperdon acuminatum* Bosc in Morgan var. *seuratii** Pat. 1904. Bull. Soc. Mycol. Fr. 20: 135.
Lit.: XVII: 233. - Patouillard 1906c: 52.
PF. Iles Gambier, Mangareva, Rikitea, among mosses on trunk of *Artocarpus* sp. (Moraceae), leg. Seurat 1655 (holotype, FH).
Current name: ***Lycoperdon pyriforme*** Pers. 1801. Syn. Meth. Fung., 148.

⇒*Lycoperdon caelatum* Bull. 1809. Hist. Champ. Fr. Gast., 156.
Lit.: VII: 115. - Patouillard 1887: 173.
NC: Locality unknown, on soil, leg. Balansa 3680 (no specimen in PC). .
Current name: ***Calvatia caelata*** (Bull.) Morgan 1890. J. Cinc. Soc. Nat. Hist. 12: 169.

⇒*Lycoperdon endotephrum* Pat. 1902b. Bull. Soc. Mycol. Fr. 18: 300. (cf. *L. wrightii).*
Lit.: XVII: 231. - Wakefield in Sarasin & Roux 1920: 105.
NC: Oubatche, on moist soil in Niaouli forest, 3 IV 1911, leg. Sarasin & Roux 35 (K); Yaté, substrate unkown, 24 III 1912, leg. Sarasin & Roux (K).
Type material originally described from Madagascar.
Current name: ***Vascellum curtisii*** (Berk.) Kreisel 1963. Repert. Nov. Spec. Regn. Veg.68: 86.

⇒*Lycoperdon lilacinum* (Berk. & Mont.) Massee 1887. J. Roy. Microb. Soc., 706.
Bas.: *Bovista lilacina* Berk. & Mont. 1845. Hooker's J. Bot. 4: 64.
Lit.: VII: 126. - Patouillard 1887: 173.
NC: Locality and collector unknown, on soil (no specimen in PC).
Current name: ***Calvatia lilacina*** (Berk. & Mont.) Henn. 1904. Hedwigia 43: 205.

⇒*Lycoperdon gemmatum* Batsch 1783. Elenchus, 147.
Lit.: Hariot & Patouillard 1903: 13. - Wakefield in Sarasin & Roux 1920: 105. - Wakefield 1922: 91. - Not cited in Reed & Farr (1993).
NC: Several localities, XI 1900, leg. Bernier (no specimen in PC); Yaté, coastal tropical forest, leg. Sarasin & Roux (no specimen in K); Mont Ignambi, 1500 feet, VIII 1914, leg. Compton 1685 (K).
Current name: ***Lycoperdon perlatum*** Pers. 1801. Syn. Meth. Fung., 145.

⇒*Lycoperdon polymorphum* Vittadini 1842. Monogr. Lyc., 39.
Lit.: Patouillard 1905: 525. - Not cited in Reed & Farr (1993).
NC: Yahoué, on soil, leg. Le Rat 1077 (PC).
Current name: ***Lycoperdon ericetorum*** Pers. 1809. J. Bot. (Paris) 2: 17.

⇒*Lycoperdon (Globaria) samoënse** Bres. & Pat. 1901. - In: Lloyd, Mycol. Not. 6: 50.
Lit.: XVI: 1117; XVII: 233.
PS: Samoa, substrate and date unknown, leg. Lloyd 1695 (holotype, FH).
Current name: ***Morganella samoënsis*** (Bres. & Pat.) Ponce 1971. Fieldiana, Bot. 34: 35.

⇒*Lycoperdon wrightii* Berk. & M.A. Curtis 1873. Grevillea 2: 50. (cf. *L. endotephrum).*
Lit.: Wakefield in Sarasin & Roux 1920: 105. - Not cited in Reed & Farr (1993).
NC: Oubatche, on soil, leg. Sarasin & Roux 35 (K); Canala, on soil, leg. Sarasin & Roux 151 (no specimen in K).
Current name: ***Vascellum curtisii*** (Berk.) Kreisel 1963. Repert. Nov. Spec. Regn. Veg.68: 86.

⇒***Marasmius amabilis**** Har. & Pat. 1903. J. Bot. (Morot) 17: 12.
Lit.: XVII: 46.
NC: Me-Mou, Houaïlou, on decomposing cortex of *Monimia anisata* (Monimiaceae), II 1901, leg. Bernier 1071 (holotype, FH).

⇒***Marasmius cylindraceocampanulatus*** Henn. 1900. Monsoonia 1: 151.
Lit.: Horak 1982: 12. NC: Païta, Mont Mou, on rotting leaves in montane rain forest, 1100 m, 20 II 1977, leg. Horak 77-130 (ZT !).

Systematic position uncertain, probably belonging to *Mycena.*

⇒***Marasmius haematocephalus*** Mont. in Fr. 1838. Epicrisis, 376.
Lit.: V: 540. - Wakefield in Sarasin & Roux 1920: 90.
NC: Koindé, substrate unknown, leg. Sarasin & Roux 166 (no specimen in K). - LI: Lifou, substrate unknown, leg. Sarasin & Roux 200 (no specimen in K).

⇒***Marasmius sulcatus**** Massee in Wakef. *et al.* in Schinz 1916. Viertelj. Naturf. Ges. Zürich 61: 629.
Syn.: *Marasmius sulcatus** Massee in Wakef. in Sarasin & Roux 1920: 91 (diagn. lat. superfl.).
Lit.: Not cited in Reed & Farr (1993).
NC: Upper Houaïlou Valley, 200 m, on wood, 7 II 1912, leg. Sarasin & Roux 175 (holotype, K); Locality, substrate and date unknown, 1966, leg. Huguenin R 240 (K).

⇒***Meiorganum neocaledonicum**** (Heim) ex Heim 1966. Rev. Mycol. 31: 157.
Syn.: *Meiorganum neocaledonicum* Heim 1965. Compt. Rend. Acad. Sci. 261: 1717 (nom. inval.).
Lit.: Heim 1965: 307.
NC: Forêt de Bon Secours, on rotten log of *Agathis lanceolata* (Araucariaceae), 2 V 1964, Heim NC 221 (holotype, PC !).; same locality, same host, 17 IV 1965, leg. Huguenin 65-262 (PC).

⇒***Melanotus flavolivens*** (Berk. & M.A. Curtis) Singer 1946. Lloydia 9: 130.
Bas.: *Agaricus flavolivens* Berk. & M.A. Curtis 1860. Proc. Amer. Acad. Arts Sci. 4: 117.
Lit.: Horak 1977b: 323. - Not cited in Reed & Farr (1993).
NC: Yaté, on rotting bark in coastal forest, 25 II 1977, leg. Horak 77-168, 77-169 (ZT !). - Bonin Islands, on plant debris, Bonin Islands (holotype, K !).

⇒*Merulius chlorinus** Pat. 1908a. Bull. Soc. Mycol. Fr. 24: 5.
Lit.: XXI: 360.
NC: Locality unknown, on the hymenium of an old polypore, leg. Le Rat 3400 (holotype, FH).
Current name: ***Gloeoporus chlorinus*** (Pat.) Ginns 1976. Can. J. Bot. 54: 125.

⇒***Microporellus obovatus*** (Jungh.) Ryvarden 1972. Norw. J. Bot. 19: 232.
Bas.: *Polyporus obovatus* Jungh. 1838. Verh. Batav. Geenootsch. 17: 65.
Lit.: VI: 90.
NC: Col de la Pirogue, 300 m, on rotten wood, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒*Microporus luteus* (Blume & Nees) Kuntze 1898. Rev. Gen. 3: 496.
Bas.: *Polyporus luteus* Blume & Nees 1826. Nov. Acta Acad. Caes. Leop. Carol. 13: 16.
Syn.: *Polystictus luteus* (Blume & Nees) Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 74.

Lit.: Hariot & Patouillard 1903: 8. - Cunningham 1965: 131. - Not cited in Reed & Farr (1993).
NC: Dumbéa, on rotten wood, V 1900, leg. Bernier 78 (PC); Tendéa, VII 1900, leg. Bernier 79 (no specimen in PC); locality, substrate and collector unknown (Cunningham, 1965).
Current name: ***Antrodiella liebmannii*** (Fr.) Ryvarden in Ryvarden & Johanson 1980. Prel. Polyp. Fl. East Afr. 257.
⇒***Mitremyces leratii**** Pat. 1906b. - In: Lloyd, Mycol. Not. 22: 273.
Lit.: VII: 68; XX: 93; XXI: 476.
NC: Païta. Mont Mou, 1200 m, on soil in cloud forest dominated by Nothofagus spp. (Fagaceae), leg. Le Rat 1640 (holotype, FH).
⇒***Morganella samoensis**** (Bres. & Pat.) Ponce 1971. Fieldiana, Bot. 34: 35.
Bas.: *Globaria samöensis* Bres. & Pat. 1901. - In Lloyd, Mycol. Writ. 1: 50.
Syn.: *Lycoperdon (Globaria) samöensis* Bres & Pat. - In: Lloyd, Mycol. Not. 6: 50.
Lit. : XVI: 1117 (as *L. samöense*); XVII: 233.
PS: Samoa, on wood, leg. Lloyd 1056 (holotype, FH, BPI).
⇒***Mycena chlorocephala**** Pat. 1908a. Bull. Soc. Mycol. Fr. 24: 9.
Lit.: XXI: 53.
NC: Païta, between Mont Mou and Mont Dzumac, on soil, in cloud forest dominated by *Nothofagus* spp. (Fagaceae), leg. Le Rat 4022 (holotype, FH).
⇒***Mycena irritans**** E. Horak 1978. Ber. Schweiz. Bot. Ges. 88: 25.
Lit.: Horak 1982: 11.
NC: N of Yaté, on rotten wood, coastal tropical forest, 3 III 1977, leg. Horak 77-59 (holotype, ZT !).
⇒***Mycena odora**** Maas Gest. & E. Horak 1995. Bibl. Mycol. 159: 195.
NC: Païta, Col de la Pirogue, 500 m, on rotten wood, tropical forest, 7 III 1977, leg. Horak 77-83 (holotype, ZT !).
⇒***Mycena pura*** (Pers.: Fr.) Kummer 1871. Führ. Pilzk., 107.
Bas.: *Agaricus purus* Pers. 1794. Neues Mag. Bot. 1: 101.
Lit.: V: 256. - Maas Geesteranus & Horak 1995: 187.
NC: Païta, Mont Mou, 1150 m, among decaying litter in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 II 1977, leg. Horak 77-209 (ZT !).
⇒***Mycena rubidolimbata**** Maas Gest. & E. Horak 1995. Bibl. Mycol. 159: 171.
NC: Païta, Col de la Pirogue, 500 m, on rotten wood, 20 II 1977, leg. Horak 77-134 (holotype, ZT !).
⇒***Mycena spinosissima*** (Singer) Desjardin 1995. Bibl. Mycol. 159: 15.
Bas.: *Marasmius spinosissimus* Singer 1950. Schweiz. Z. Pilzk. 28: 193.
Syn.: *Amparoina spinosissima* (Singer) Singer 1958. Mycologia 50: 110.
Lit.: Horak 1980b: 64.
NC: Yaté, on rotting wood and bark of angiospermic tree, coastal tropical forest, 30 m, 5 III 1977, Horak 77-74 (ZT !).
⇒***Mycena stylobates*** (Pers.: Fr.) Kummer 1871. Führ. Pilzk., 108.
Bas.: *Agaricus stylobates* Pers. 1801. Synopsis, 390.
Lit.: V: 295. - Patouillard 1906c: 52.
PF: Tahiti, on rotten wood, leg. Seurat (no specimen in PC).
⇒***Mycena vulgaris*** (Pers.) Kummer 1871. Führ. Pilzk., 108.
Bas.: *Agaricus vulgaris* Pers. 1794. Neues Mag. Bot. 1: 104.
Lit.: V: 295. - Wakefield in Sarasin & Roux 1920: 90.

LI: Locality and substrate unknown, leg. Sarasin & Roux 239 (no specimen in K).

⇒*Naucoria pediades* (Fr.) Kummer 1871. Führ. Pilzk., 78.
Bas.: *Agaricus pediades* Fr. 1821. Syst. Mycol. 1: 290.
Lit.: V: 580. - Patouillard 1905: 525.
NC: Yahoué, on soil, leg. Le Rat 1125 (no specimen in PC).
Current name: ***Agrocybe pediades*** (Fr.) Fayod 1889. Ann. Sci. Nat., sér. 7, 9: 358.
⇒***Naematoloma neocaledonica*** (Guzmán & E. Horak) Guzmán 1980. Mycotaxon 12: 236.
Bas.: *Psilocybe neocaledonica* Guzmán & E. Horak 1978. Sydowia 31: 53.
NC: Païta, Mont Mou, 1000 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-161 (holotype, ZT !).
⇒***Nigroporus vinosus*** (Berk.) Murrill 1905. Bull. Torr. Bot. Cl. 32: 361.
Bas.: *Polyporus vinosus* Berk. 1852. Ann. Mag. Nat. Hist., sér. 2, 9: 195.
Lit.: XXIII: 383.
NC: Col de la Pirogue, 300 m, on rotten wood of tree, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒***Osmoporus proteus*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 249.
Bas.: *Polyporus proteus* Berk. 1843. Hooker's J. Bot. 2: 514.
Lit.: Cunningham 1965: 249. - Not cited in Reed & Farr (1993).
NC: Locality, substrate and collector unknown.

⇒***Panaeolus campanulatus*** (L.: Fr.) Quél. 1872. Champ. Jura Vosges 1: 151.
Bas.: *Agaricus campanulatus* L. 1755. Fl. Suec. 1: 276.
Lit.: V: 1121. - Patouillard 1906c: 52. PF: Tahiti, on dung, leg. Seurat (no specimen in PC).
⇒***Paxillus chalybaeus**** E. Horak 1979. Sydowia 32: 157.
NC: Païta, Mont Mou, 1150 m, on soil in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 20 II 1977, leg. Horak 77-24 (holotype, ZT !); same locality, 1200 m, 20 II 1977, leg. Horak 77-13 (ZT !).
⇒*Phellinus conchatus* (Pers.) Quél. 1886. Enchiridion, 173.
Bas.: *Boletus conchatus* Pers. 1796. Obs. Mycol. 1: 24.
Lit.: VI: 174. - Patouillard 1887: 171. - Patouillard 1905: 523.
NC: Locality and collector unknown, on tree trunks (PC); Tendéa, on myrtaceous tree, leg. Le Rat 1080 (PC).
Current name: ***Xanthochrous conchatus*** (Pers.) Pat. 1897. Cat. rais. Pl. cell. Tunis, 52.
⇒***Phellinus ferruginosus*** (Schrad.) Pat.1900. Essai Tax., 97.
Bas.: *Boletus ferrugineus* Schrad. 1794. Spic. Fl. Germ., 172.
Lit.: Patouillard 1906c: 50. - Not cited in Reed & Farr (1993).
PF: Tahiti, on dead wood, leg. Seurat (no specimen in PC).
⇒*Phellinus scruposus* (Fr.) Pat. 1905. Agr. Prat. Pays Chauds 5: 523.
Bas.: *Polyporus scruposus* Fr. 1838. Epicrisis, 473.
Lit.: VI: 121. - Hariot & Patouillard 1903: 9.
NC: Yahoué, on log of *Lantana* sp. (Verbenaceae), leg. Le Rat 1063 (no specimen in PC); Ile des Pins, substrate unknown, IX 1901, leg. Bernier 1115 (no specimen in PC).

Current name: ***Fomes scruposus*** (Fr.) C.G. Cunningham 1948. Bull. N.Z. Dep. Scient. Res. 79: 11.

⇒***Phylacteria palmata*** (Scop.) Pat. 1887. Bull. Soc. Mycol. Fr. 3: 172.
Bas.: *Clavaria palmata* Scop. 1772. Fl. Carn. 2: 483.
Syn.: *Thelephora palmata* (Scop.) Fr. 1821. Syst. Mycol. 1: 432.
Lit.: V: 529. - Patouillard 1887: 172. - Hariot & Patouillard 1903: 11. - Patouillard 1905: 525.
NC: Tchiaou, on soil, leg. Balansa 3674, 3675 (no specimen in PC); Coindé, substrate unknown, II 1901, leg. Bernier 1075 (no specimen in PC); Nouméa, on soil, leg. Le Rat 1100 (no specimen in PC).

⇒***Piptoporus portentosus*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 106.
Bas.: *Polyporus portentosus* Berk. 1844. Hooker's J. Bot. 3: 188.
Lit.: VI: 140. - Cunningham 1965: 106.
NC: Locality, collector and substrate unknown.

⇒***Pleurotus lux**** Har. 1892. J. Bot. (Morot) 6: 411.
Lit.: XI: 27, XII: 586. PF: Bora Bora and Tahiti, on forest soil, leg. Brunaud (holotype, PC).

⇒***Pleurotus septicus*** Fr. 1821. Syst. Mycol. 1: 192.
Lit.: V: 375. - Wakefield in Sarasin & Roux 1920: 90.
NC: Yaté, coastal tropical forest, leg. Sarasin & Roux (no specimen in K).

⇒***Pleurotus stella**** Pat. 1915. Bull. Soc. Mycol. Fr. 31: 33.
Lit.: XXIII: 113.
NC: Hienghène, on decaying trunk, leg. Le Rat 3809 (holotype, FH).

⇒***Pleurotus tahitensis**** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 51.
Lit.: XXI: 65.
PF: Tahiti, Fakahina, on dead trunk of *Pandanus* sp. (Pandanaceae), leg. Seurat 3815 (holotype, FH); Tuamotu, substrate unknown, leg. Seurat (no specimen in PC).

⇒*Podoscypha affinis* (Berk. & M.A. Curtis) Pat. 1900. Essai Tax., 71.
Bas.: *Thelephora affinis* Berk. & M.A. Curtis 1868. J. Linn. Soc. Bot. 10: 329.
Lit.: VI: 530. - Patouillard 1905: 522.
NC: Houaïlou, substrate unknown, leg. Le Rat 1091 (PC).
Current name: ***Podoscypha venustula*** ssp. ***cuneata*** (Speg.) D.A. Reid 1965. Beih. Nova Hedwigia 18: 264.

⇒*Podoscypha aurantiaca* (Pers.) Pat. in Har. & Pat. 1903. J. Bot. (Morot) 17: 6.
Bas.: *Thelephora aurantiaca* Pers. in Gaudichaud 1827. Voy. Uranie Bot., 176.
Lit.: VI: 526. - Hariot & Patouillard 1903: 6.
NC: Houaïlou, Carovin, on rotten lianas, V 1901, leg. Bernier 1081 (PC).
Current name: ***Cotylidia aurantiaca*** (Pers.) Welden 1958. Lloydia 21: 40.

⇒***Podoscypha mellisii*** (Berk. ex Sacc.) Bres. 1928. Mém. Acad. Malg. 6: 11.
Bas.: *Stereum mellisii* Berk. ex Sacc. 1884. Grevillea 13: 3.
Syn.: *Lloydella mellisii* (Berk. ex Sacc.) Bres. 1915. Hedwigia 56: 300.
Lit.: VI: 553.
NC: Yaté, 30 m, on rotten bark, tropical coastal forest, 25 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒*Polyporus annularis* Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 52.
Lit.: VI: 89. - Wakefield in Sarasin & Roux 1920: 93.
LI: Lifou, substrate unknown, leg. Sarasin & Roux (no specimen in K).

Current name: ***Ganoderma annulare*** (Fr.) Gilbertson in Lowe & Gilbertson 1962. Mycologia 53: 505.

⇒***Polyporus arcularius*** (Batsch) Fr. 1821. Syst. Mycol. 1: 342.
Bas.: *Boletus arcularius* Batsch 1783. Elenchus Fung. 1: 97.
Lit.: VI: 67. - Hariot & Patouillard 1903: 7. - Wakefield in Sarasin & Roux 1920: 93.
NC: Bourail, Gouaro, substrate unknown, XI 1900, leg. Bernier 1045 (no specimen in PC); Canala, substrate unknown, 21 X 1911, leg. Sarasin & Roux 113 (K); Monts Koghis, 300 m, on rotten wood, tropical forest, 23 II 1977, leg. Horak, det. Ryvarden (ZT). - LI: Lifou, on dead wood, 5 XI 1964, leg. Huguenin NC 65-012 (K).

⇒*Polyporus australis* Fr. 1828. Elenchus Fung. 1: 108.
Lit.: XXIII: 377, 378. - Müller 1887: 77.
NC: Monts Koghis, on rotten log, 1886, leg. Savès (no specimen in PC).
Current name: ***Ganoderma applanatum*** (Pers.) Pat. 1889a. Bull. Soc. Mycol. Fr. 5: 67.

⇒***Polyporus blanchetianus*** Berk. & Mont. 1849. Ann. Sc. Nat. Bot., sér. 3, 11: 238.
Lit.: VI: 87. - Wakefield in Sarasin & Roux 1920: 93.
NC: Locality and substrate unknown, leg. Sarasin & Roux 4979 (K).
Identity of taxon doubtful.

⇒*Polyporus durus* Jungh. 1818. Praem. Flor. Crypt. Java, 62.
Bas.: *Polyporus durus* Jungh. 1838. Verh. Batav. Genoot Kunst. Wet. 17: 62.
Lit.: VI: 147. - Wakefield 1922: 88.
NC: Mont Ignambi, 2000 feet, substrate unknown, VIII 1914, leg. Compton 1747 (K); Locality and substrate unknown, 1963-1964, leg. Huguenin NC 64-016 (K).
Current name: ***Nigroporus durus*** (Jungh.) Murrill 1907. Bull. Torr. Bot. Cl. 34: 471.

⇒*Polyporus elegans* (Bull.) Fr. 1838. Epicrisis, 440.
Bas.: *Boletus elegans* Bull. 1780. Herb. Fr., 46.
Lit.: VI: 85.
NC: Païta, Mont Mou, 1200 m, on rotten wood, in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 28 III 1977, leg. Horak, det. Ryvarden (ZT).
Current name: ***Melanopus elegans*** (Bull.) Pat. 1900. Essai Tax., 80.

⇒*Polyporus flabelliformis* Klotzsch 1833. Linnaea 8: 483.
Syn.: *Polystictus flabelliformis* (Klotzsch) Fr. 1851. Nova Acta Roy. Soc. Sci. Upsal. 3, 1: 74.
Lit.: VI: 216. - Patouillard 1887: 170. - Müller 1887: 77. - Hariot & Patouillard 1903: 8. - Wakefield in Sarasin & Roux 1920: 96. - Wakefield 1922: 89. - Cunningham 1965: 155.
NC: Païta, Mont Mou, 300 m, on rotten wood, collector unknown (no specimen in PC); Monts Dzumac, on *Montrouziera* sp. (Clusiaceae), VIII 1964, leg. Huguenin NC 64-474 (K); Monts Koghis, 1886, leg. Savès (no specimen in PC); same locality, on dead wood, V 1964, leg. Huguenin NC 64-206, 64-246, 64-249 (K); Me-Arembo, Houaïlou, IV 1901, leg. Bernier 899 (no specimen in PC); Mont Ignambi, 1300 m, in cloud forest, VIII 1914, leg. Compton 1748 (K); Mont Canala, 650 m, 1914, leg. Compton 1355 (K); Oubatche, Tchalabel Valley, leg. Sarasin & Roux (no specimen in K); Col d'Amieu, on dead wood, 3 VI 1964, leg. Huguenin NC 64-313, NC 64-314 (K); same locality, IV 1969, leg. Fougerousse 441 (K); Ile de Pins, substrate unknown, IX 1901, leg. Bernier (no specimen in PC).
Current name: ***Microporus affinis*** (Blume & Nees: Fr) Kuntze 1898. Rev. Gen. Pl. 3: 494.

⇒*Polyporus flabellum* Mont. 1842. Ann. Scienc. Nat. Bot. 2, 17: 126.

Lit.: VI: 233. - Patouillard 1887: 170.
NC: Nouméa, on dead logs, leg. Balansa 2660 (no specimen in PC).
Current name: ***Coriolus flabellum*** (Mont.) Murrill 1905. Bull. Torr. Bot. Cl. 32: 648.
⇒*Polyporus fuscomaculatus** Bres. & Pat. 1901. - In: Lloyd, Mycol. Not. 1: 49.
Lit.: XVI: 1115, XVII: 112, XX: 483. PS: Samoa, substrate and date unknown, leg. Lloyd 2351 (holotype, FH).
Current name: ***Tyromyces udus*** (Jungh.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 133.
⇒*Polyporus grammocephalus* Berk. 1842. Hooker's J. Bot. 1: 148.
Lit.: VI: 92. - Hariot & Patouillard 1903: 7.
NC: Dumbéa, on "bancoulier" (Rhizophoraceae), V 1900, leg. Bernier 147 (no specimen in PC); Col de la Pirogue, 300 m, on rotten wood, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).
Current name: ***Tyromyces grammocephalus*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 135.
⇒***Polyporus grammocephalus*** Berk. var. ***favoloides*** (Henn.) Wakef. in Sarasin & Roux 1920. Nova Caledonia, 93.
Bas.: *Polyporus favoloides* Henn. 1897. Engler's Bot. Jahrb. 23: 546.
Lit.: XIV: 173. - Wakefield in Sarasin & Roux 1920: 93.
NC: Koindé, substrate unknown, 13 I 1912, leg. Sarasin & Roux 164 (K); Dothio, on *Hibiscus tiliaceus* (Malvaceae), 14 VII 1964, leg. Huguenin NC 64-428 (K).
⇒*Polyporus hirsutus* (Wulfen) Fr. 1821. Syst. Mycol. 1: 367.
Bas.: *Boletus hirsutus* Wulfen in Jacq. 1788. Coll. 2: 149.
Lit.: XV: 65. - Patouillard 1887: 170. - Müller 1887: 77. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 9. - Patouillard 1905: 523. - Wakefield in Sarasin & Roux 1920: 97.
NC: Monts Koghis, substrate unknown, VI 1886, leg. Savès (no specimen in PC); Bourail, on tree trunks, leg. Balansa (no specimen in PC); Amédée, on *Myoporium* sp. (Myoporaceae) , leg. Le Rat 1064 (no specimen in PC); Boghen, on *Casuarina* sp. (Casuarinaceae), leg. Le Rat 1058 (no specimen in PC); Magenta, on *Casuarina* sp. (Casuarinaceae), I 1900, leg. Bernier 53 (no specimen in PC); Ilot Amédée, on *Myoporum* sp. (Myoporaceae), VIII 1900, leg. Bernier 908, 909 (no specimen in PC); Ile des Pins, substrate unknown, IX, leg. Bernier 1124, 1125 (no specimen in PC). - LI: Maré, substrate unknown, leg. Sarasin & Roux 134; Lifou, substrate unknown, leg. Sarasin & Roux 199 (no specimen in K); Lifou, Wé, on dead wood, 5 XI 1964, leg. Huguenin NC 65-042 (K).
Current name: ***Trametes hirsuta*** (Wulfen: Fr.) Lloyd 1924. Mycol. Not. 73: 1319.
⇒*Polyporus lucidus* (Curtis) Fr. 1821. Syst. Mycol. 1: 353.
Bas.: *Boletus lucidus* Curtis 1781. Fl. Lapp., 224.
Lit.: VI: 157. - Müller 1887: 77.
NC: Monts Koghis, substrate unknown, 1886, leg. Savès (no specimen in PC).
Current name: ***Ganoderma lucidum*** (Curtis) P. Karst. 1881. Rev. Mycol. (Toulouse) 3: 17.
⇒*Polyporus (Mesopus) mycenoides** Pat. 1887. Bull. Soc. Mycol. Fr. 3: 169.
Lit.: IX: 163, XII: 1013, XX: 487.
NC: Bourail, terrestrial ?, III 1869, leg. Balansa 2362 (holotype, FH).
Current name: ***Filoboletus manipularis*** (Berk.) Singer 1945. Lloydia 8: 215.
⇒*Polyporus ostreiformis* Berk. 1878. J. Linn. Soc. Bot. 16: 46.

Lit.: VI: 110. - Wakefield in Sarasin & Roux 1920: 93.
NC: Oubatche, substrate unknown, leg. Sarasin & Roux 18 (no specimen in K). - LI: Lifou (no specimen in K).
Current name: ***Funalia ostreiformis*** (Berk.) Murrill 1907. Bull. Torr. Bot. Cl. 34: 474.

*⇒Polyporus pachyphloeus** Pat. 1889b. J. Bot. (Morot) 3: 257.
Lit.: Wakefield in Sarasin & Roux 1920: 94. - Not cited in Reed & Farr (1993).
LI: Lifou, substrate unknown, 1911-1912, leg. Sarasin & Roux 245 (K). - Fidji, on tree trunks, 1875, leg. Filhol 3106 (holotype, FH).
Current name: ***Phellinus pachyphloeus*** (Pat.) Pat. 1900. Essai Tax., 97.

⇒Polyporus pancheri* Pat. 1887. Bull. Soc. Mycol. Fr. 3: 170.
Lit.: VI: 81, IX: 165, XII: 598, 601, XX: 489 (fide Saccardo XXIII: 381).
NC: Bourail, on tree trunks, leg. Pancher (holotype lost ?).

Identity of taxon doubtful (Cunningham 1965: 277). Probably contaxic or close *to Polyporus (Melanopus) versiformis.*

⇒Polyporus pergamenus Fr. 1838. Epicrisis, 480.
Syn.: *Trichaptum pergamenum* (Fr.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 100.
Lit.: XXIII: 381. - Patouillard 1887: 170.
NC: Païta, Mont Mou, on rotten wood, leg. Balansa 2607 (no specimen in PC).
Current name: ***Trichaptum biforme*** (Fr.) Ryvarden 1972. Norw. J. Bot. 19: 237.

⇒Polyporus polychrous Cesati 1879. Myc. Born., 4.
Lit.: Patouillard 1887: 169. - Not cited in Reed & Farr (1993).
NC: Ile des Pins, on rotten wood, collector unknown 721 (no specimen in PC); Canala, on dead wood, collector unknown (no specimen in PC).

Identity doubtful.

⇒Polyporus rugulosus (Lév.) 1844. Ann. Sci. Nat. Bot. sér. 3, 2:189.
Lit.: VI: 168. - Patouillard 1906c: 47.
PF: Tahiti, substrate unknown, leg. Seurat (no specimen in PC); Iles Gambier, Mangareva, substrate unknown, leg. Seurat (no specimen in PC).
Current name: ***Leptoporus rugulosus*** (Lév.) Pat. 1915. Philipp. J. Sci. C, 10: 91.

*⇒Polyporus spermatolepidis** Pat. 1898. Bull. Soc. Mycol. Fr. 14: 153.
Lit.: XXVI: 707, XVI: 147, 707, XXI: 268.
NC: Locality unknown, on *Melaleuca* sp. (Myrtaceae), collector unknown 3170 (FH ?); on trunk of *Spermatolepis gemmifera* (Myrtaceae), collector unknown, 3270 (holotype, FH).
Current name: ***Xanthochrous niaouli*** Pat. 1901. Agric. Prat. Pays Chauds 1: 263.

⇒Polyporus versiformis Berk. 1854. Hooker's J. Bot. 6: 137.
Lit.: VI: 81, IX: 165, XII: 598, 601, XX: 489 (*fide* Saccardo XXIII: 381).
NC: Bourail, on tree trunks, leg. Balansa (FH).
Current name: ***Polyporus pancheri*** Pat. 1887. Bull. Soc. Mycol. Fr. 3: 170.

⇒Polyporus virgatus Berk. & M.A. Curtis 1868. J. Linn. Soc. Bot. 10: 304.
Lit.: VI: 66.
NC: Col de la Pirogue, 300 m, on rotten wood, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒Polysaccum crassipes DC. & Desports 1807. Rapp. Bot. Voy. l'Ouest Fr. 1: 8.
Lit.: VII: 147, 148, 490. - Patouillard 1887: 174.
NC: Locality and collector unknown, on bare soil (no specimen in PC).

Current name: ***Pisolithus tinctorius*** (Micheli: Pers.) Coker & Couch 1928. Gast. East US Canada, 170.

⇒*Polysaccum microcarpum* (Cooke & Massee) 1887. Grevillea 16: 28.
Lit.: VII: 490. - Hariot & Patouillard 1903: 13.
NC: Yahoué, on loamy soil, III 1900, leg. Bernier 16 p.p. (no specimen in PC).
Current name: ***Pisolithus microcarpus*** (Cooke & Massee) G.H. Cunningham 1931. Proc. Linn. Soc. NSW 56: 290.

⇒*Polysaccum pisocarpium* Fr. 1829. Syst. Mycol. 3: 54.
Lit.: VII: 147, 149, 490. - Hariot & Patouillard 1903: 13.
NC: Yahoué, on loamy soil, III 1900, leg. Bernier 16 p.p. (no specimen in PC).
Current name: ***Pisolithus tinctorius*** (Micheli: Pers.) Coker & Couch 1928. Gast. East US Canada, 170.

⇒*Polysaccum pusillum** Har. & Pat. 1903. J. Bot. (Morot) 17: 13.
Lit.: XVII: 237.
NC: La Foa, Tendéa, on soil, I 1900, leg. Bernier 1452 (holotype, FH; 74 p.p., PC).
Current name: ***Pisolithus tinctorius*** (Micheli: Pers.) Coker & Couch 1928. Gast. East US Canada, 170.

⇒*Polystictus aratus* (Berk.) Cooke 1886. Grevillea 14: 86.
Bas.: *Polyporus aratus* Berk. 1878. J. Linn. Soc. Bot. 16: 53.
Lit.: XXIII: 376. - Patouillard 1902a: 767. - Wakefield in Sarasin & Roux 1920: 96.
NC: Oubatche, substrate unknown, leg. Sarasin & Roux 108 (no specimen in K); Nouméa, on *Acacia spirorbis* (Mimosaceae), 14 IV 1965, leg. Huguenin R 260 (K); Yaté, La Pagode, on *Casuarina cunninghamiana* (Casuarinaceae), 2 VIII 1964, leg. Huguenin R 223 (K); Negropo, on dead tree trunk, 2 VI 1964, leg. Huguenin NC 64-308 (K); Rivière de Thi, on *Casuarina cunninghamiana* (Casuarinaceae), 2 III 1965, leg. Huguenin NC 65-038 (K); Houaïlou, on *Citrus medica* (Rutaceae), 23 VII 1964, leg. Huguenin NC 65-047 (K).
Current name: ***Coriolopsis strumosa*** (Fr.) Ryvarden 1976. Kew Bull. 31: 95.

⇒*Polystictus cichoriaceus* Berk. in Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 92.
Lit.: XXIII: 455. - Hariot & Patouillard 1903: 9. - Wakefield in Sarasin & Roux 1920: 96.
NC: Mont Mou, on rotten wood, 300 m, IV 1870, leg. Balansa 2960 (PC); Mont Ignambi, 1300 m, in cloud forest, Sarasin & Roux (no specimen in K); Yaté, coastal tropical forest, leg. Sarasin & Roux 187 (K); Ile des Pins, on rotting roots, IX 1901, leg. Bernier 1115 (PC).
Current name: ***Cyclomyces setiporus*** (Berk.) Pat. 1900. Essai Tax., 98.

⇒*Polystictus flabelliformis* (Klotzsch) Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 74.
Bas.: *Polyporus flabelliformis* var. *flabelliformis* Klotzsch 1833. Linnaea 8: 483.
NC: Me-Arembo, Houaïlou, IV 1901, collector unknown, 899 (PC); Mont Mou, on rotten wood, 300 m, IV 1870, leg. Balansa 2959 and 2659 (PC).
Current name: ***Microporus flabelliformis*** (Klotzsch) Kuntze 1898. Rev. Gen. Pl. 3: 496.

⇒*Polystictus flabelliformis* (Klotzsch) var. *crenatolobatus** Pat. 1887: Bull. Soc. Mycol. Fr. 3: 170.
Lit.: XXI: 308. - Patouillard 1887: 170.
NC: Locality unknown, on dead tree trunks, leg. Le Rat 2406 (holotype, FH; no specimen in PC).

Current name: ***Microporus flabelliformis*** (Klotzsch) Pat. var. ***crenatolobatus*** Pat. 1908a. Bull. Soc. Mycol. Fr. 24: 4.

⇒*Polystictus gallopavonis* (Berk. & Broome) Cooke 1886. Grevillea 14: 80.
Bas.: *Polyporus gallopavonis* Berk. & Broome 1882. Trans. Linn. Soc. Bot., ser. 2, 2: 59.
Lit.: VI: 234. - Wakefield in Sarasin & Roux 1920: 97.
LI: Lifou, substrate unknown, leg. Sarasin & Roux 220 (no specimen in K).
Current name: ***Trametes blumei*** (Lév.) G.H. Cunningham 1965. Bull. N.Z. Dep. Sci. Ind. Res. 164-161.

⇒*Polystictus occidentalis* (Klotzsch) Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 90.
Bas.: *Polyporus occidentalis* Klotzsch 1833. Linnaea 8: 486.
Lit.: VI: 274. - Patouillard 1887: 171. - Patouillard 1905: 522. - Wakefield in Sarasin & Roux 1920: 97.
NC: Locality and substrate unknown, 1870, leg. Pancher 719 (PC); Oubatche, substrate unknown, leg. Sarasin & Roux 5 (no specimen in K); locality unknown, on dead wood, leg. Le Rat (no specimen in PC).
Current name: ***Coriolopsis polyzona*** (Pers.) Ryvarden 1972. Norw. J. Bot. 19: 230.

⇒*Polystictus persoonii* (Mont.) Cooke 1886. Grevillea 14: 85.
Bas.: *Polyporus persoonii* Mont. in Bélanger 1834. Voy. Ind. Orient., Bot. 2: 147.
Lit.: VI: 272. - Hariot & Patouillard 1903: 9. - Patouillard 1905: 522. - Wakefield in Sarasin & Roux 1920: 97. NC: Farino, on dead *Acacia* sp. (Mimosaceae), I 1900, leg. Bernier 27 (PC); La Crouen, on *Coffea robusta* (Rubiaceae), 3 VI 1964, leg. Huguenin R 71 (K); same locality, on dead wood, 3 VI 1964, leg. Huguenin NC 64-448 (K); Aore, on *Theobroma cacao* (Byttneriaceae), I 1964, leg. Huguenin NC 64-132 (K); La Foa, on *Casuarina* sp. (Casuarinaceae), I 1900, leg. Bernier (PC); Oubatche, leg. Sarasin & Roux 10 (K); Canala, substrate unknown, 17 X 1911, leg. Sarasin & Roux 111 (K); Loctarino, on *Casuarina* sp. (Casuarinaceae), leg. Le Rat 4041 (no specimen in PC); Magenta, on *Acacia spirorbis* (Mimosaceae), leg. Le Rat 1089 (no specimen in PC); Ile des Pins, substrate unknown, IX 1901, leg. Bernier 1130 (no specimen in PC).
Current name: **Trametes persoonii** (Mont.) Pat. 1900. Essai Tax., 93.

⇒*Polystictus sanguineus* (L.) Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 75.
Bas.: *Boletus sanguineus* L. 1763. Spec. Plant., 1646.
Lit.: VI: 229. - Patouillard 1887: 170. - Hariot & Patouillard 1903: 8. - Patouillard 1905: 523. - Wakefield in Sarasin & Roux 1920: 97. - Wakefield 1922: 89.
NC: Nouméa, on rotten trunks, VI 1886, leg. Savès in Roumeguère, Fungi Gall. Exs., 4015 (K); same locality, date unknown, 1914, leg. Compton 234 (K); same locality, 4 VIII 1969, leg. Cheeseman (K); Bourail, on dry *Melaleuca quinquenervia* (Myrtaceae), VI 1899, leg. Bernier 154 (no specimen in PC); Yahoué, on *Melaleuca quinquenervia* (Myrtaceae), leg. Le Rat 1073 (no specimen in PC); Ile des Pins, substrate unknown, 1854, leg. McGillivray (K). - LI: Maré, substrate unknown, leg. Sarasin & Roux 132, (K); Lifou, substrate unknown, leg. Sarasin & Roux 24 (K).
Current name: ***Pycnoporus sanguineus*** (L.) Murrill 1904. Bull. Torr. Bot. Cl. 31: 421.

⇒*Polystictus tabacinus* (Mont.) Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 93.
Bas.: *Polyporus tabacinus* Mont. 1835. Ann. Sci. Nat. Bot., sér. 3, 3: 349.
Lit.: XXIII: 377, 383. - Patouillard 1887: 170. - Hariot & Patouillard 1903: 8. - Wakefield in Sarasin & Roux 1920: 97.
NC: Monts Koghis, 1050 m, on rotten trunks in cloud forest, collector unknown, 756 (no specimen in PC); same locality, on dead tree, 7 VII 1964, leg. Huguenin NC 64-

473 (K); Tendéa, on living saxifragageous plant, I 1900, leg. Bernier 37 (no specimen in PC); Mont Ignambi, 1300 m, in cloud forest, leg. Sarasin & Roux (no specimen in K); Mont Canala, substrate unknown, 650 m, leg. Sarasin & Roux (no specimen in K).
Current name: ***Cyclomyces tabacinus*** (Mont.) Pat. 1900. Essai Tax., 98.
⇒*Polystictus xanthopus* (Fr.) Fr. 1851. Nova Acta R. Soc. Sci. Upsal. 3, 1: 74.
Bas.: *Polyporus xanthopus* Fr. 1818. Obs. Mycol. 2: 255.
Lit.: VI: 215. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 8. - Wakefield in Sarasin & Roux 1920: 98, Wakefield 1922: 89.
NC: Tendéa, on *Cupania* sp. (Sapindaceae), VII 1900, leg. Bernier 18 (PC); Yahoué, on *Acacia* sp. (Mimosaceae), VI 1900, leg. Bernier (no specimen in PC); Malaoui, on rotten wood, leg. Bernier, several collections (no specimen in PC); Tchalabel Valley, substrate unknown, leg. Sarasin & Roux 44 (no specimen in K); Canala, substrate, date and collector unknown, 721 (PC); Mont Canala, substrate unknown, VI 1914, leg. Compton 1354 (K); Ermitage Stream, substrate unknown, I 1914, leg. Compton 233 (K); Col de la Pirogue, 300 m, on rotten bark of tree, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT); Ile des Pins, substrate unknown, IX 1901, leg. Bernier (no specimen in PC). - LI: Lifou, substrate unknown, leg. Sarasin & Roux (no specimen in K).
Current name: ***Microporus xanthopus*** (Fr.) Kuntze 1898. Rev. Gen. Pl. 3: 494.
⇒***Poria fumosa**** Bres. & Pat. 1901. - In: Lloyd, Mycol. Not. 1: 49.
Lit.: XVI: 1116, XVII: 132.
PS: Samoa, substrate and date unknown, leg. Lloyd 3459 (holotype, FH).
⇒***Poria hyposclera*** Berk. ex Cooke 1882. Grevillea 10: 103.
Lit.: VI: 302. - Wakefield in Sarasin & Roux 1920: 98.
NC: Tchalabel Valley, substrate unknown, leg. Sarasin & Roux 42 (holotype, no specimen in K).
⇒***Psathyrella disseminata*** (Pers.: Fr.) Quél. 1872. Champ. Jura Vosges, 123.
Bas.: *Agaricus disseminatus* (Pers.: Fr.) S.F. Gray 1821. Nat. Arrangem. Brit. Pl. 1: 634.
Lit.: VI: 1134. - Wakefield in Sarasin & Roux 1920: 92.
NC: La Foa, substrate unknown, leg. Sarasin & Roux 171 (no specimen in K).
⇒***Pterula capillaris*** (Lév.) Saccç. 1888. Syll. Fung. VI: 742.
Bas.: *Merisma capillaris* Lév. 1844. Ann. Sci. Nat., sér. 3, 2: 208.
Lit.: XII: 1018; XX: 549. - Hariot & Patouillard 1903: 6.
NC: Houaïlou, Néaria, on *Juncus* sp. (Juncaceae), in swamp, III 1901, leg. Bernier 1072 (no specimen in PC).
⇒*Pterula fascicularis** Bres. & Pat. 1901. - In: Lloyd, Mycol. Not. 1: 50.
Lit.: XVI: 1116, XVII: 200.
PS: Samoa, substrate and collector unknown, 1838 (holotype, FH).
Current name: ***Deflexula fascicularis*** (Bres. & Pat.) Corner 1950. Monogr. Clav., 395.
⇒***Pyrrhoglossum hepatizon*** (Berk.) Singer 1951. Sydowia 5: 474.
Bas.: *Agaricus hepatizon* Berk. 1847. Hooker's J. Bot. 6: 486 bis.
Lit.: Horak 1989: 118. - Not cited in Reed & Farr (1993).
NC: Païta, Mont Mou, 800 m, on rotten wood, 19 II 1977, leg. Horak 77-46 (ZT !).
⇒***Pyrrhoglossum pyrrhum*** (Berk. & M.A. Curtis) Singer 1944. Mycologia 36: 367.
Bas.: *Agaricus pyrrhus* Berk. & M.A. Curtis 1868. J. Linn. Soc. Bot. 10: 291.
Lit.: Horak 1989: 120. - Not cited in Reed & Farr (1993).
NC: Païta, Mont Mou,700 m, on rotten wood, 5 III 1977, leg. Horak 77-68 (ZT!).

⇒***Rozites neocaledonica**** E. Horak 1981. Sydowia 34: 101.
NC: Païta, Mont Mou, 1000-1200 m, on soil among litter in cloud forest dominated by *Nothofagus* spp. (Fagaceae), 22 I 1977, leg. Horak 77-34 (holotype, ZT !); same locality, 20 I 1977, leg. Horak 77-10 (ZT !).
⇒***Russula echinospora**** Heim 1967b. Rev. Mycol. 32: 207.
Bas.: *Russula echinospora* Heim 1967a. Rev. Mycol. 32: 3 (nom. inval.); non *Russula echinospora* Singer (1939) 1940. Bull Soc. Mycol. Fr. 55: 270.
NC: Forêt du Bon Secours, on rotten wood of *Nothofagus* sp., 2 V 1964; leg. Heim 220 (holotype, PC).

⇒*Schizophyllum alneum* (Reichard) Kuntze 1898. Rev. Gen. Pl. 3: 516.
Lit.: V: 655. - Hariot & Patouillard 1903: 12.
NC: Pouéta, on debris of "bancoulier" (Rhizophoraceae) and *Acacia* sp. (Mimosaceae), VI 1900, leg. Bernier 142 (PC).
Current name: ***Schizophyllum commune*** Fr. 1821. Syst. Mycol. 1: 330.
⇒***Schizophyllum commune*** Fr. 1821. Syst. Mycol. 1: 330.
Lit.: V: 655. - Patouillard 1887: 168. - Müller 1887: 77. - Patouillard 1906c: 51. - Wakefield in Sarasin & Roux 1920: 92, Wakefield 1922: 88.
NC: Nouméa, 1949, leg. Cheeseman 2002 (K); Ermitage Stream, I 1914, leg. Compton 188 (K); Canala, Mont Atso, Monts Koghis, Mont Mou, Oubatche, very common on rotten trunks (no specimen in PC); Ile des Pins, on *Araucaria cookei* (Araucariaceae), X 1853, leg. Herald (K). - LI: Lifou, Maré, collector, substrate and date unknown (K). - PF: Tahiti, on *Hibiscus tiliaceus* (Malvaceae), leg. Seurat (no specimen in PC).
⇒*Schizophyllum commune* var. *flabellare* Fr. 1837. Afzel. Fung. Guin. 24, tab. 11.
Lit.: Patouillard 1887: 168. - Not cited in Reed & Farr (1993).
NC: Nouméa, in forest, 1869, leg. Balansa 2616 (PC); Païta, Mont Mou, very common on rotten trunks in cloud forest dominated by *Nothofagus* spp. (Fagaceae) (PC, several collectors).
Current name: ***Schizophyllum commune*** Fr. 1821. Syst. Mycol. 1: 330.
⇒***Scleroderma geaster*** Fr. 1829. Syst. Mycol. 3: 46.
Lit.: VII: 138, 139. - Hariot & Patouillard 1903: 13. - Patouillard 1905: 525.
NC: Prony, on iron-rich soil, III 1900, leg. Bernier 15 (no specimen in PC); Bourg, on soil, leg. Le Rat 1074 (no specimen in PC).
⇒*Scleroderma vulgare* Fr. 1829. Syst. Mycol. 3: 46.
Lit.: Patouillard 1887: 174.
NC: Locality unknown, on soil, collector unknown (no specimen in PC).
Current name: ***Scleroderma aurantium*** (L.) Pers. 1801. Syn. Meth. Fung., 153.
⇒*Secotium erythrocephalum* Tulasne & C. Tulasne 1845. Ann. Sci. Nat. Bot., sér. 3, 4: 176.
Lit.: VII: 54. - Wakefield in Sarasin & Roux 1920: 104.
NC: Mont Ignambi, 800-1300 m, in cloud forest, 19 XI 1911, leg. Sarasin & Roux 24 (K).
Current name: ***Weraroa erythrocephala*** (Tulasne & C. Tulasne) Singer & Smith 1958. Bull. Torr. Bot. Cl. 85: 329.
⇒*Spongipellis stramineus** Pat. 1908b. Bull. Soc. Mycol. Fr. 24: 166.
NC: Locality unknown, on tree trunks in humid forest, leg. Le Rat 2542 (holotype, FH).

Current name: ***Polyporus stramineus*** (Pat.) Hendrickx 1948. Publ. Inst. Nat. Etud. Agron. Congo Belge 35: 8.

⇒***Stereum campaniforme**** Pat. 1908b. Bull. Soc. Mycol. Fr. 24: 165.

Lit.: XXI: 386.

NC: Locality unknown, on tree trunks, leg. Le Rat 2211 (holotype, FH).

⇒*Stereum caperatum* (Berk. & Mont.) Berk. 1881. J. Linn. Soc. Bot. 18: 385.

Bas.: *Thelephora caperata* Berk. & Mont. 1849. Ann. Sci. Nat., sér. 3, 11: 241.

Lit.: VI: 523. - Wakefield 1922: 89.

NC: Mont Ignambi, on dead logs, 2000 feet, VIII, collector unknown (no specimen in K).

Current name: ***Cymatoderma caperatum*** (Berk. & Mont.) D.A. Reid 1956. Kew Bull. 10: 635.

⇒***Stereum fasciatum*** (Schwein.) Fr. 1838. Epicrisis, 546.

Bas.: *Thelephora fasciata* Schwein., Car., Nr. 1012.

Lit.: VI: 560. - Patouillard 1887: 172.

NC: Locality, substrate and collector unknown (no specimen in PC).

⇒*Stereum involutum* Klotzsch in Fr. 1838. Epicrisis, 546.

Lit.: VI: 560. - Hariot & Patouillard 1903: 6. - Wakefield in Sarasin & Roux 1920: 100.

NC: Monts Koghis, on dead wood, 6 V - 27 VII 1964, leg. Huguenin NC 64-192, NC 64-222, NC 64-446 (K); La Foa, Tendéa, on dead *Cupania* sp. (Sapindaceae) I 1900, leg. Bernier 49 (PC); Ile des Pins, substrate unknown, IX 1901, leg. Bernier (PC). - LI: Lifou, substrate unknown, leg. Sarasin & Roux 257 (no specimen in K).

Current name: ***Podoscypha involuta*** (Klotzsch in Fr.) Imazeki 1952. Bull. Gov. For. Exp. Dtat. 57: 98.

⇒*Stereum lamellatum* (Berk. & M.A. Curtis) Cooke in Sacc. 1888. Syll. Fung. VI: 523.

Bas.: *Thelephora lamellata* Berk. & M.A. Curtis 1851. Amer. J. Sci. Arts 11: 94.

Lit.: VI: 523. - Wakefield in Sarasin & Roux 1920: 100.

NC: Koindé, substrate unknown, leg. Sarasin & Roux 157 (no specimen in K); Ignambi, substrate unknown, VIII 1914, leg. Compton 1749 (K); La Crouen, on dead wood, 12 VII 1964, leg. Huguenin NC 64-452 (K); Nouméa, Forêt de Thi, on dead wood, 3 V 1964, leg. Huguenin NC 64-179 (K). - LI: Lifou, substrate unknown, leg. Sarasin & Roux 254 (K).

Current name: ***Cymatoderma elegans*** var. ***lamellatum*** (Berk. & M.A. Curtis) D.A. Reid 1965. Beih. Nova Hedwigia 18: 122.

⇒***Stereum latum*** Cooke & Massee in Cooke 1882. Grevillea 20: 92.

Lit.: VI: 523. - Hariot & Patouillard 1903: 7.

NC: Yahoué, on wild *Citrus* sp. (Rutaceae), VI 1900, leg. Bernier 905 (PC).

⇒***Stereum lobatum*** Kunze: Fr. 1838. Epicrisis, 547.

Lit.: VI: 568. - Hariot & Patouillard 1903: 6. - Patouillard 1887: 172. - Wakefield in Sarasin & Roux 1920: 100.

NC: Locality unknown, in the forest on rotten wood, 1870, leg. Pancher 729 (PC); Monts Koghis, on dead wood, V 1964, leg. Huguenin NC 64-205, NC 64-248 (K); same locality, on rotten wood, 900 m, 23 II 1977, leg. Horak (K); Yahomé, on dead wood, 1 V 1964, leg. Huguenin NC 64-135 (K); La Foa, Tendéa, on rotten wood, VII 1900, leg. Bernier 903 (no specimen in PC); locality unknown, on tree trunks, collector unknown (PC); Mont Canala, substrate unknown, 650 m, leg. Sarasin & Roux 120 (no specimen in K); Ile des Pins, date unknown, leg. Milne 221 (K). LI: Maré, substrate and date unknown, leg. Sarasin & Roux 133 (K); Lifou, on dead wood, 5 XI 1964, leg. Huguenin NC 65-011 (K).

⇒***Stereum neocaledonicum**** Har. & Pat. 1903. J. Bot. (Morot) 17: 6.
Lit.: XVII: 164. - Wakefield in Sarasin & Roux 1920: 100.
NC: Houaïlou, Méa, on dead wood, V 1901, leg. Bernier 1047 (holotype, FH; isotype, K and PC); Mont Ignambi, on dead branches, 800 m, leg. Sarasin & Roux 75 (K).

⇒***Stereum ostrea*** (Blume & Nees ex Fr.) Fr. 1838. Epicrisis, 547.
Bas.: *Thelephora ostrea* Blume & Nees 1826. Nova Acta Acad. Caes. Leopl. Carol. 13: 13.
Lit.: VI: 571.
NC: Col d'Amieu, 550 m, on rotting bark of branches, tropical forest, 3 III 1977, leg. Horak (ZT).

⇒***Stereum perlatum*** Berk. 1842. Hooker's J. Bot. 1: 153.
Lit.: VI: 576. - Wakefield in Sarasin & Roux 1920: 101.
NC: Mont Ignambi, on rotten wood in cloud forest, 1200 m, leg. Sarasin & Roux 30 (no specimen in K).

⇒***Stereum rimosum*** Berk. 1851. Hooker's J. Bot. 3: 169.
Lit.: VI: 568. - Wakefield in Sarasin & Roux 1920: 101, Wakefield 1922: 90.
NC: Mont Ignambi, on rotten wood in cloud forest, 1000 m, 29 IV 1911, leg. Sarasin & Roux 47 (K); Ermitage Stream, on dying tree, I 1914, leg. Compton 155 (K).

⇒*Stereum spongiaepes* Berk. 1881. J. Linn. Soc. Bot. 18: 385.
Lit.: VI: 554. - Wakefield in Sarasin & Roux 1920: 101.
NC: Hienghène, substrate unknown, leg. Sarasin & Roux 54 (no specimen in K).
Current name: ***Cymatoderma elegans*** var. ***lamellatum*** (Berk. & M.A. Curtis) D.A. Reid 1965. Beih. Nova Hedwigia 18: 122.

⇒*Stereum (Lloydella) umbrinoalutaceum** Wakef. ap Wakef. *et al.* in Schinz 1916. Viertelj. Naturf. Ges. Zürich 61: 629.
Syn.: *Stereum umbrinoalutaceum* Wakef. in Sarasin & Roux 1920. Nova Caledonia, 101 (diagn. superfl.).
Lit.: Not cited in Reed & Farr (1993).
NC: Gulf of Prony, 100 m, on dead branches, IV 1912, leg. Sarasin & Roux 195 (holotype, no specimen in K).
Current name: ***Porostereum umbrinoalutaceum*** Hjortstam & Ryvarden 1990. Syn. Fung. 4: 53.

⇒***Stilbum subiculosum**** Pat. 1904. Bull. Soc. Mycol. Fr. 20: 138.
Lit.: XVIII: 631.
PF: Iles Gambier, Mangareva, on decaying bark of *Citrus aurantius* (Rutaceae), leg. Seurat 7884 (holotype, FH).

⇒*Trametes aratoides** Har. & Pat. 1903. J. Bot. (Morot) 17: 8.
Lit.: XVII: 136. - Patouillard 1905: 522. - Wakefield in Sarasin & Roux 1920: 98. - Cunningham 1965: 202.
NC: Méa, Houaïlou, on dead wood, III 1901, leg. Bernier 1048 (holotype, PC); Tendéa, on *Cupania* sp. (Sapindaceae), leg. Le Rat 1065 (PC); Mont Ignambi, substrate unknown, 800 m, leg. Sarasin & Roux 76 (no specimen in K).
Current name: ***Phellinus discipes*** (Berk.) Ryvarden 1976. Kew Bull. 31: 88.

⇒***Trametes atra**** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 49.
Lit.: XXI: 344.

PF: Tahiti, on tree trunks, leg. Seurat 2756 (holotype, FH).
⇒*Trametes badia* Berk. 1842. Hooker's J. Bot. 1: 151.
Lit.: Patouillard 1902a: 767. - Not cited in Reed & Farr (1993).
NC: Locality, substrate and collector unknown (no specimen in PC).
Current name: ***Coriolopsis aspera*** (Jungh.) Teng 1963. Chung-kuo Ti Chen-chun, 759.
⇒*Trametes cinnabarina* (Jacq.) Fr. 1838. Epicrisis, 473.
Bas.: *Boletus cinnabarinus* Jacq. 1776. Fl. Austr. 4: 2.
Lit.: VI: 353. - Patouillard 1887: 171. - Hariot & Patouillard 1903: 9. - Wakefield in Sarasin & Roux 1920: 98. NC: Ile des Pins, substrate unknown, IX 1901, leg. Bernier 1123 (no specimen in PC). - LI: Lifou, substrate unknown, leg. Sarasin & Roux (K).
Current name: ***Pycnoporus cinnabarinus*** (Jacq.) P. Karst. 1881. Rev. Mycol. (Toulouse) 3, 9: 18.
⇒***Trametes cornea*** Pat. 1890. J. Bot. (Morot) 4: 16.
Lit.: IX: 197. - Hariot & Patouillard 1903: 9.
NC: Ile des Pins, on rotten roots, IX 1901, leg. Bernier 1129 (PC).
⇒***Trametes decussata**** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 49.
Lit.: XXI: 342.
PF: Tuamotu, Hao, on trunks of *Cocos nucifera* (Palmae), leg. Seurat 2782 (holotype, FH).
⇒*Trametes flava* (Jungh.) Pat. 1900. Essai Tax., 93.
Bas.: *Polyporus flavus* Jungh. 1838. Prae. Fl. Crypt. Jav. Ins., 46.
Lit.: VI: 486. - Hariot & Patouillard 1903: 9.
NC: Nouméa, on dead wood, VIII 1900, leg. Bernier 106 (no specimen in PC); Prony, VII 1914, leg. Franc (PC); Ile des Pins, IX 1901, leg. Bernier 1114 (PC).
Current name: ***Trichaptum flavum*** (Jungh.) G.H. Cunningham 1965. N.Z. Dept. Sci. Ind. Res. Bull. 164: 101.
⇒*Trametes lactinea* (Berk.) Sacc. 1888. Syll. Fung. 6: 343.
Bas.: *Polyporus lactineus* Berk. 1842. Ann. Mag. Nat. Hist. 10: 373.
Lit.: Hariot & Patouillard 1903: 8. - Patouillard 1905: 522. - Not cited in Reed & Farr (1993).
NC: La Foa, substrate unknown, leg. Le Rat 1087 (PC); Ile des Pins, in swamp on rotten roots of *Melaleuca quinquenervia* (Myrtaceae), IX 1901, leg. Bernier 1123 (PC).
Current name: ***Coriolus lactineus*** (Berk.) C.G. Cunningham 1950 Proc. Linn. Soc. NSW 75: 229.
⇒*Trametes (Polyporus) luteoolivacea* Berk. & Broome 1879. Trans. Linn. Soc. Bot., ser. 2, 1: 402.
Syn.: *Coriolopsis luteoolivacea* (Berk. & Broome) Teng 1963. Chung-kuo Ti Chen-chun, 759.
Lit.: XXIII: 380. - Patouillard 1905: 522.
NC: Bourail, on *Melaleuca quinquenervia* (Myrtaceae), leg. Le Rat 1070 (no specimen in PC); Tendea, substrate unknown, leg. Le Rat 1090 (no specimen in PC).
Current name: ***Coriolopsis strumosa*** (Fr.) Ryvarden 1976. Kew Bull. 31: 95.
⇒*Trametes muelleri* Berk. 1868. J. Linn. Soc. Bot. 10: 320.
Syn.: *Lenzites muelleri* (Berk.) Pat. 1900. Essai Tax., 89.
Lit.: IX: 198. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 8. - Patouillard 1906c: 49.
NC: Locality, substrate and collector unknown (no specimen in PC); La Foa, on *Melaleuca quinquenervia* (Myrtaceae), I 1900, leg. Bernier 42 (PC); Ile des Pins, substrate

unknown, IX 1901, leg. Bernier (no specimen in PC). - PF: Iles Gambier, Mangareva, on *Cocos nucifera* (Palmae), leg. Seurat (no specimen in PC).
Current name: ***Lenzites elegans*** (Fr.) Pat. 1900. Essai Tax., 89.
⇒*Trametes obstinata* Cooke 1883. Grevillea 12: 17.
Lit.: XXIII: 442. - Patouillard 1902a: 767. - Hariot & Patouillard 1903: 9.
NC: La Foa, on saxifragaceous plant, I 1900, leg. Bernier 26 (PC).
Current name: ***Sclerodepsis meyenii*** (Klotzsch) Ryvarden 1972. Norw. J. Bot. 19: 236.
⇒***Trametes villosa*** (Swartz) Kreisel 1971. Ciencias Biol., ser. 4, 16: 84.
Bas.: *Boletus villosus* Swartz 1806. Fl. Ind. Occ. 3: 1923.
Lit.: XXIII: 380.
NC: Yaté, 30 m, on rotten bark of tree, coastal tropical forest, 3 III 1977, leg. Horak, det. Ryvarden (ZT).
⇒*Tremella foliacea* Persoon 1822. Myco. Eur. 1: 101.
NC: Nouméa, Forêt de Thi, on dead wood, 3 V 1964, leg. Huguenin NC 64-185 (K).
Current name: ***Tremella fimbriata*** Fr. 1822. Syst. Mycol. 2: 212.
⇒***Tremella fuciformis*** Berk. 1856. Hooker's J. Bot. 8: 277.
Lit.: VI: 782. - Wakefield in Sarasin & Roux 1920: 103.
NC: Mont Canala, substrate unknown, 750 m, leg. Sarasin & Roux 118 (no specimen in K); Koindé, substrate unknown, leg. Sarasin & Roux 168 (no specimen in K). - LI: Lifou, substrate unknown, IV 1912, leg. Sarasin & Roux 250 (K).
⇒***Tremella samoensis**** Lloyd 1919.
Mycol. Notes 5 (No. 60): 875.
PS: Samoa, on rotten wood, date unknown, leg. Lloyd (holotype, BPI ?).
⇒***Tyromyces citreus*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 137.
Bas.: *Polyporus citreus* Berk. 1872. J. Linn. Soc. Bot. 13: 162.
Lit.: Not cited in Reed & Farr (1993).
NC: Col de la Pirogue, 300 m, on rotten branches, tropical forest, 19 II 1977, leg. Horak, det. Ryvarden (ZT).

⇒***Ungulina contracta*** (Berk.) Pat. 1900. Essai Tax., 103.
Bas.: *Polyporus contractus* Berk. 1847. Hooker's J. Bot. 4: 503.
Lit.: VI: 146. - Hariot & Patouillard 1903: 10.
NC: Pouéta, on dead wood, VII 1900, leg. Bernier 124 (PC); Tendéa, on different myrtaceaous plants, I 1900, leg. Bernier 46 (no specimen in PC).
⇒***Ungulina cubensis*** (Mont.) Pat. 1900. Essai Tax., 102.
Bas.: *Polyporus cubensis* Mont. 1837. Ann. Sci. Nat., 2 sér., 8: 364. 52. Cent. 1: 52.
Lit.: VI: 146. - Patouillard 1902a: 767.
NC: Locality, substrate, date and collector unknown (PC).
Identity of taxon doubtful.
⇒***Ungulina fasciata*** (Swartz) Har. & Pat. 1903. J. Bot. (Morot) 17: 10.
Bas.: *Boletus fasciatus* Swartz. 1806. Fl. Ind. Occ. 3. 1922.
Syn.: *Polyporus fasciatus* (Swartz) Fr. 1821. Syst. Mycol. 1: 373.
Lit.: VI: 200. - Hariot & Patouillard 1903: 10.
NC: Tendéa, on living "azou", I 1900, leg. Bernier 31 (PC).
Identity of taxon doubtful.
⇒***Ungulina Le Rati**** Pat. 1905. Agric. Prat. Pays Chauds 5: 524.
Lit.: Not cited in Reed & Farr (1993).

NC: Pic Malaoui, on dead wood, leg. Le Rat 1084 (holotype, PC).

Identity of taxon doubtful.

⇒***Ungulina obesa**** Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 50. Syn.: *Fomes obesus* (Pat.) Sacc. & Trotter 1912. Syll. Fung. XXI: 294.

Lit.: XXI: 294.

PF: Tuamotu, Apataki, on stems of *Cocos nucifera* (Palmae), leg. Seurat 3244 (holotype, FH).

⇒***Ungulina polychroa**** Pat. 1905. Agric. Prat. Pays Chauds 5: 524.

Lit.: Not cited in Reed & Farr (1993).

NC: Bourail, on *Ficus* sp. (Moraceae), leg. Le Rat 1062 (holotype, PC).

Identity of taxon doubtful.

⇒*Ungulina semitosta* Berk. 1854. Hooker's J. Bot. 6: 143.

Lit.: Patouillard 1902a: 767. - Not cited in Reed & Farr (1993).

NC: Locality, substrate and collector unknown (PC). - LI: Lifou, VII 1859, collector unknown (PC).

Current name: ***Fomitopsis semitostus*** (Berk.) Ryvarden 1972. Norw. J. Bot. 19: 231.

⇒*Ungulina spermolepidis* Pat. var. *pandani**Pat. 1906c. Bull. Soc. Mycol. Fr. 22: 51. Syn.: *Polyporus eucalyptorum* Fr. 1847 (Pl. Preiss. 2: 135).

Lit.: XXI: 268. - Patouillard 1905: 524. - Not cited in Reed & Farr (1993).

NC: Locality and substrate unknown, leg. Vieillard 1859 (PC); Locality and substrate unknown, leg. Le Rat 1135 (PC). - PF: Tahiti, Papeete, on trunk of a *Pandanus* sp. (Pandanaceae), leg. Seurat (holotype, FH).

Listed in Saccardo 1912 (Syll. Fung. XXI: 268) under *Polyporus spermatolepidis* Pat. The type variety, *Ungulina spermolepidis* Pat. 1898 (Bull. Soc. Mycol. Fr. 14: 153), is reported to grow on *Spermolepis* sp. (Myrtaceae).

Current name: ***Piptoporus portentosus*** (Berk.) G.H. Cunningham 1965. N.Z. Dep. Sci. Ind. Res. Bull. 164: 106.

⇒***Vararia rosulenta**** Boidin, Lanquetin & McKee 1986. Windahlia 16: 81.

NC: Yaté, on dead branches of *Dacrydium araucarioides* (Dacrydiaceae), 200 m, 1 IX 1985, leg. McKee 11049 (LY).

⇒***Volvariella taylori*** (Berk. & Brome) Singer 1951. Lilloa 22: 401.

Bas.: *Agaricus taylori* Berk. & Broome 1854. Ann. Mag. Nat. Hist., ser. 2, 13: 398.

Lit.: Patouillard 1906c: 51. - Not cited in Reed & Farr (1993).

PF: Tahiti, on rotten roots of *Musa* sp. (Musaceae), leg. Seurat (no specimen in PC).

⇒***Volvariella volvacea*** (Bull.: Fr.) Singer 1951. Lilloa 22: 401.

Bas.: *Agaricus volvaceus* Bull.: Fr. 1821. Syst. Mycol. 1: 278.

Lit.: V: 657. - Patouillard 1906c: 51.

PF: Tahiti, on rotten roots of *Musa* sp. (Musaceae), leg. Seurat (no specimen in PC).

⇒***Xanthochrous bernieri**** Har. & Pat. 1903. J. Bot. (Morot) 17: 9.

Syn.: *Polyporus bernieri* (Har. & Pat.) Sacc. & Trotter 1905. Syll. Fung. XVII: 110.

NC: Ile des Pins, on rotting trunks, IX 1901, leg. Bernier 3131 (holotype, FH; isotype, PC).

⇒***Xanthochrous niaouli**** Pat. 1901. Agric. Prat. Pays Chauds 1: 263.

Syn.: *Polyporus niaouli* (Pat.) Sacc. & Trotter 1905. Syll. Fung. XVII: 109.

Lit.: Hariot & Patouillard 1903: 10. - Patouillard 1905: 523. - Wakefield in Sarasin & Roux 1920: 96.

NC: Saint-Louis, on living *Melasperma quinquenervia* (Myrtaceae), II 1900, leg. Bernier 9 (PC); Pic Malaoui, on *Rhus atra*, leg. Le Rat 1049 (PC); on *Melasperma quinquenervia* (Myrtaceae), collector unknown, 3170 (holotype, FH); Tchalabel Valley, substrate unknown, leg. Sarasin & Roux 38 (no specimen in K); Ile des Pins, substrate unknown, IX 1901, leg. Bernier 1122 p.p. (PC). - LI: Lifou, substrate unknown, leg. Sarasin & Roux (no specimen in K).

⇒*Xanthochrous rimosus* (Berk.) Pat. 1900. Essai Tax., 101.

Bas.: *Polyporus rimosus* Berk. 1845. Hooker's J. Bot. 4: 54.

Lit.: Hariot & Patouillard 1903: 10. - Patouillard 1905: 523. - Not cited in Reed & Farr (1993).

NC: Saint-Louis, on logs of *Milnea* sp. (Myrsinaceae), II 1901, leg. Bernier 10 (PC); Ile des Pins, substrate unknown, IX 1901, several collections, leg. Bernier (no specimen in PC); Prony, on *Bruguiera rumphii* (Rhizophoraceae), leg. Le Rat 1039 (no specimen in PC).

Current name: ***Fulvifomes rimosus*** (Berk.) Fiasson & Niemelä 1984. Karstenia 24: 26.

ACKNOWLEDGEMENTS

In tracing specimens and literature the authors are much indebted to the following colleagues: H. Hürlimann (Basel, Switzerland), D. N. Pegler (Kew, UK), D. Pfister (Farlow Herbarium, USA), L. Ryvarden (Oslo, Norway). Interesting informations were also provided by T. Jaffré and G. Dagostini, Laboratoire de Botanique (Centre ORSTOM de Nouméa), J. Jérémie and Ch. Tirel, Laboratoire de Phanérogamie (MNHN, Paris). This study was undertaken as part of the multidisciplinary project 'Land Biodiversity in New Caledonia' of the Muséum National d'Histoire Naturelle, Paris.

REFERENCES

BRESADOLA, G. & PATOUILLARD, N. 1901 - Diagnoses of new species of fungi from Samoa. In: Lloyd, C.G. Mycol. Notes 1: 49-51.

COOKE, W.B. 1961 - The cyphelllaceous fungi. Sydowia Beih. 4: 1-144.

CORNER, E.J.H. 1954 - Further descriptions of luminous agarics. Trans. Brit. Mycol. Soc. 37: 256-271.

CUNNINGHAM, G.H. 1965 - Polyporaceae of New Zealand. N.Z. Dep. Sci. Ind. Res. Bull. 164: 1-304.

GUZMAN, G. & HORAK, E. 1978 - New species of *Psilocybe* from Papua New Guinea, New Caledonia and New Zealand. Sydowia 31: 44-54.

HALLE, N. 1977 - Part.8. Orchidacées, p. 4-565. In 'Flore de la Nouvelle Calédonie et Dépendances'. Muséum National d'Histoire Naturelle, Paris.

HARIOT, P. & PATOUILLARD, N. 1903 - Quelques champignons de la Nouvelle-Calédonie, de la collection du Muséum. J. Bot. (Morot) 17: 6-15.

HEIM, R. 1965 - Les Meiorganés, phylum reliant les Bolets aux Polypores. Rev. Mycol. 30: 307-329.

HEIM, R. 1967a - Notes sur la flore mycologique des Terres du Pacifique Sud. 5. Une Russule à spores échinulées. Rev. Mycol. 32: 3-15.

HEIM, R. 1968a - Notes sur la flore mycologique des Terres du Pacifique Sud. 8. Nouvelles recherches sur *Le Ratia* Pat. Rev. Mycol. 33: 137-154.

HENNINGS, P. 1903 - *Squamotubera* P. Henn. n. gen. Xylariacearum. Hedwigia 42 Beih.: 308-309.

HOOG, de G.S. 1972 - The genera *Beauveria*, *Isaria*, *Tritirachium*, and *Acrodontium* gen. nov. Stud. Mycol. 1: 1-41.

HORAK, E. 1977a - *Crepidotus episphaeria* and related species from the southern hemisphere. Ber. Schweiz. Bot. Ges. 87: 227-235.

HORAK, E. 1977b - The genus *Melanotus* Pat. Persoonia 9: 305-327.

HORAK, E. 1978 - *Mycena rorida* (Fr.) Quél. and related species from the southern hemisphere. Ber. Schweiz. Bot. Ges. 88: 20-29.

HORAK, E. 1979 - Paxilloid Agaricales in Australasia. Sydowia 32: 154-166.

HORAK, E. 1980a - New and remarkable Hymenomycetes from tropical forests in Indonesia (Java) and Australasia. Sydowia 33: 39-63.

HORAK, E. 1980b - Taxonomy and distribution of two little known monotypic genera of Agaricales: *Amparoina*, *Cystoagaricus*. Sydowia 33: 64-70.

HORAK, E. 1980c - Supplementary remarks to *Austroboletus* (Corner) Wolfe (Boletaceae). Sydowia 33: 71-87.

HORAK, E. 1980d - Indian Boletales and Agaricales. Revisions and new taxa. Sydowia 33: 88-110.

HORAK, E. 1980e - On Australasian species of *Lepiota* S.F. Gray (Agaricales) with spurred spores. Sydowia 33: 11-144.

HORAK, E. 1980f - *Entoloma* (Agaricales) in Indomalaya and Australasia. Nova Hedwigia Beih. 65: 1-352.

HORAK, E. 1981a - Notes on taxonomy and biogeography of *Rozites* Karsten. Sydowia 34: 94-108.

HORAK, E. 1981b - *Conchomyces* v. Overeem - an independent genus within the Agaricales ?. Sydowia 34: 109-114.

HORAK, E. 1982 - Mycogeography in the South Pacific region: Agaricales, Boletales. Austr. J. Bot., Suppl. Ser. 10: 1-41 (In: "Pacific Mycogeography: a Preliminary Approach").

HORAK, E. 1989 - New and additional data concerning *Pyrrhoglossum* and eccentric or laterally stipitate taxa of *Gymnopilus* (Agaricales). Opera Bot. 100: 115-129.

HORAK, E. & DESJARDIN, D.E. 1994 - Reduced marasmioid and mycenoid agarics from Australasia. Aust. Syst. Bot. 7: 153-170.

HORAK, E. & KOBAYASI, Y. 1978 - List of New Guinean species of Agaricales s. l. Trans. Mycol. Soc. Japan 19: 103-107.

HORAK, E. & WOOD, A. 1990 - *Cortinarius* Fr. (Agaricales) in Australasia. 1. Subgen. *Myxacium* und *Paramyxacium*. Sydowia 42: 88-168.

HUGUENIN, B. 1964 - Micromycètes du Pacifique Sud I. - Parasites foliicoles des *Pandanus*. Bull. Soc. Mycol. Fr. 80: 172-185.

HUGUENIN, B. 1969 - Micromycètes du Pacifique Sud VII. - Méliolinées de Nouvelle-Calédonie. Rev. Mycol. (Paris) 34: 23-61.

KIRK, P.M. & ANSELL, A.E. 1992 - Authors of fungal names. Index of Fungi, suppl. IMI. 95 pp.

KOBAYASI, Y. 1981 - Gelatinous members of Agaricales with poroid, lamellate and reticulate hymenium from tropical regions. Trans. Mycol. Soc. Japan 22: 419-427.

MAAS GEESTERANUS, R.A. & HORAK, E. 1995 - *Mycena* and related genera from Papua New Guinea and New Caledonia. Bibl. Mycol. 159: 143-229.

MCKEE, H. S. 1966 - Les étapes de la connaissance botanique de la Nouvelle-Calédonie. In 'Phytochimie et Plantes Médicinales des Terres du Pacifique'. Colloques

Internationaux du Centre National de la Recherche Scientifique No. 144, Nouméa (Nouvelle-Calédonie), 28 avril - 5 mai 1964, Editions du CNRS, 15 quai Anatole-France, Paris VII, pp. 19-31.

MCKEE, H.S. & MCKEE, M.E. 1981 - E. Vieillard et E. Deplanche, deux grands botanistes collecteurs en Nouvelle-Calédonie. Histoire et Nature 17-18: 49-67.

MCNABB, R.F.R. 1965 - Taxonomic studies in the Dacryomycetaceae. 3. *Dacryopinax* Martin. N.Z. J. Bot. 3: 59-72.

MOUCHACCA, J. 1990a - Fungos do Brazil exsiccata découverts dans l'Herbier Mycologique de Nouvelle-Calédonie. Crypt., Mycol. 11: 129-144.

MOUCHACCA, J. 1990b - Champignons de Nouvelle-Calédonie I. Quelques Dématiées intéressantes de litières forestières. Persoonia 14: 151-160.

MOUCHACCA, J. 1990c - Champignons de Nouvelle-Calédonie I. Quelques Dématiées intéressantes de litières forestières. Nova Hedwigia 51: 459-468.

MOUCHACCA, J. 1997 - Francis BUGNICOURT (1907-1991). Crypt., Mycol. 18: 173-181.

MOUCHACCA, J. (in press) - Ascomycetes described from New Caledonia, South Pacific Region. (Mycotaxon)

MOUCHACCA, J. & MCKENZIE, E.H.C. 1994 - Deuteromycetes of New Caledonia. Fifth International Mycological Congress, ABSTRACTS, August 14-21, 1994, Vancouver, University of British Columbia, Poster Abstract, p. 149.

MOUCHACCA, J. & ZUCCONI L. 1994 - Fungi of New Caledonia III. Some interesting dematiaceous hyphomycetes from leaf litter. Crypt., Mycol. 15: 27-38.

MÜLLER, J. (Müller-Argiovensi), 1887 - Enumeration de quelques lichens de Nouméa. Rev. Myc. (Toulouse) 9(34):77-82.

PATOUILLARD, N. 1887 - Champignons de la Nouvelle-Calédonie. 1. Bull. Soc. Mycol. Fr. 3: 168-178.

PATOUILLARD, N. 1889a - Le genre *Ganoderma*. Bull. Soc. Myc. Fr. 6: 64-80.

PATOUILLARD, N. 1889b - Fragments mycologiques. 7. Champignons nouveaux. J. Bot. (Morot) 3: 25-32.

PATOUILLARD, N. 1898 - Champignons nouveaux ou peu connus. 2. Bull. Soc. Mycol. Fr. 14: 149-158.

PATOUILLARD, N. 1900 - Essai taxonomique sur les familles et les genres de Hyménomycètes. Lons-Le-Saunier. 184 pp.

PATOUILLARD, N. 1901 - Quelques champignons des colonies françaises. Agric. Prat. Pays Chauds 1: 262-265.

PATOUILLARD, N. 1902a - Quelques champignons des colonies françaises. Agric. Prat. Pays Chauds 1: 766-767.

PATOUILLARD, N. 1902b - Description de quelques champignons extra-européens. Bull. Soc. Mycol. Fr. 18: 299-303.

PATOUILLARD, N. 1904 - Description de quelques champignons nouveaux des Iles Gambier. Bull. Soc. Mycol. Fr. 20: 135-138.

PATOUILLARD, N. 1905 - Champignons de la Nouvelle-Calédonie recueillis par M. Le Rat. Agr. Prat. Pays Chauds 5: 522-526.

PATOUILLARD, N. 1906a - A large species of *Cyphella*. - In: Lloyd, C.G. Mycol. Writ. 2 (21): 258.

PATOUILLARD, N. 1906b - Un *Mitremyces* de la Nouvelle-Calédonie. - In: Lloyd, Mycol. Writ. 2 (21): 273-274.

PATOUILLARD, N. 1906c - Champignons recueillis par M. Seurat dans la Polynésie française. Bull. Soc. Mycol. Fr. 22: 45-62.

PATOUILLARD, N. 1907 - *Le Ratia*, nouveau genre de la série des *Cauloglossum*. Bull. Soc. Mycol. Fr. 23: 50-52.

PATOUILLARD, N. 1908a - Champignons nouveaux ou peu connus. Bull. Soc. Mycol. Fr. 24: 1-12.

PATOUILLARD, N. 1908b - Champignons de la Nouvelle-Calédonie. Bull. Soc. Mycol. Fr. 24: 165-168.

PATOUILLARD, N. 1909 - Champignons de la Nouvelle-Calédonie. Bull. Soc. Mycol. Fr. 25: 129-134.

PATOUILLARD, N. 1911 - Champignons de la Nouvelle-Calédonie. Bull. Soc. Mycol. Fr. 27: 34-38.

PATOUILLARD, N. 1915 - Champignons de la Nouvelle-Calédonie. Bull. Soc. Mycol. Fr. 31: 31-35.

PATOUILLARD, N. & HARIOT, P. 1912 - Fungorum novorum decas quarta. Bull. Soc. Mycol. Fr. 28: 280-284.

PEGLER, D.N. 1983 - The genus *Lentinus*. Kew Bull. Add. Ser. 10: 1-281.

PFISTER, D.H. 1977 - Annotated Index to Fungi described by N. Patouillard. Contributions to Reed herbarium No. 25: 1-211.

REED, C.F. & FARR, D.F. 1993 - Index to Saccardo's Sylloge Fungorum vol. I-XXVI in XXIX (1882-1972). Contr. 6, US Nat. Fungus Collections, Beltsville, Maryland Rose Printing Inc., Tallahassee, Florida, USA. 884 pp.

SAYRE, G. 1975 - Cryptogamae Exsiccatae. - An annotated bibliography of exsiccatae of Algae, Lichens, Hepaticae and Musci. V. Unpublished exsiccatae. Memoirs of the New York Botanical Gardens 19: 277-423.

SHAW, D.E. 1984 - Microorganisms in Papua New Guinea. Res. Bull. 33: 1-344. Dept. Prim. Ind., Port Moresby.

SINGER, R. 1945 - The Boletinoideae of Florida, with notes on extralimital species. Farlowia 2: 97-141.

VIEILLARD, E. 1862 - Plantes utiles de la Nouvelle-Calédonie. Ann. Sc. Nat. ser. 4, 16: 228-76.

WAKEFIELD, E.M. 1920 - Fungi of New Caledonia and the Loyalty Islands. - In: F. Sarasin & J. Roux: Nova Caledonia. Berlin & Wiesbaden, 176 pp.

WAKEFIELD, E.M. 1922 - Plants from New Caledonia. Fungi. J. Linn. Soc. Bot. 46: 88-93.

WAKEFIELD, E.M., MASSEE, G. & COTTON, A.D. 1916 - In Schinz, H.: Neukaledonische Pilze. Viertelj. Nat. Forsch. Ges. Zürich 61: 628-632.

TAXA TREATED FOLLOWING CURRENT NAMES

(names between brackets represent basionyms)

Agaricus (Lepiota) australis	moist soil
Agaricus campester	substrate unknown
Agrocybe pediades	*Naucoria pediades*; on soil
Amanita pumila	on soil in coastal tropical forest,
Amauroderma rude	*Amauroderma rudie*; substrate unknown
Amauroderma rugosum	*Fomes rugosus*; substrate unknown, dead & living tree,
Amauroderma rugosum	*Ganoderma rugosum;* substrate unknown
Amauroderma subrugosum	*Ganoderma subrugosum*; substrate unknown
Androsaceus umbrinus	on decaying pods and branches of leguminous plants
Antrodiella liebmannii	*Microporus luteus;* on rotten wood, substrate unknown

Aphelaria flabellata	*Clavaria flabellata*; on forest litter
Auricularia auricula	substrate unknown
Auricularia delicata	on dead tree
Auricularia delicata	*Laschia tremellosa;* substrate unknown
Auricularia mesenterica	substrate unknown
Auricularia mesenterica	*Auricularia tremellosa;* substrate unknown
Auricularia polytricha	*Hirneola polytricha;* on rotten trunks & *Ficus* sp.
Auricularia velutina	*(Laschia velutina);* on rotten wood
Austroboletus novaezelandiae	on soil in cloud *Nothofagus* spp. forest
Bjerkandera adusta	*Leptoporus adustus;* on rotten wood
Boletellus ananas	on iron-rich soil
Boletellus emodensis	substrate unknown
Boletellus pallescens	substrate unknown
Boletus perroseus	on soil in cloud *Nothofagus* spp. forest
Boletus phytolaccae	on rotten wood in cloud forest
Calocera glossoides	substrate unknown
Calvatia caelata	*Lycoperdon caelatum*; on soil
Calvatia lilacina	*Calvatia cyathiformis*; on soil
Calvatia lilacina	*Lycoperdon lilacinum*; on soil
Calyptella crateriformis	*Cyphella crateriformis*; on fallen branches
Calyptella grandis	*Cyphella grandis*; on tree bark
Campanella sarasinii	*Favolus sarasinii*; on wood
Catilla pandani	(*Cyphella pandani*); on branches of *Pandanus* sp.
Cladoderris infundibuliformis	(*Actinostroma infundibuliformis*); on tree trunks
Claudopus miraculosus	on rotten tree wood
Clavaria striata	on soil in cloud *Nothofagus* spp. forest
Coltricia cinnamomea	*(Boletus cinnamomeus*); on bare forest lateritic soil
Coltricia dependens	*Coltriciella dependens*; on rotten wood in forest
Colus hirundinosus	on sand
Conchomyces bursaeformis	on rottten wood of *Nothofagus* sp.
Coprinus miniatofloccosus	substrate unknown
Coriolopsis aspera	(*Trametes aspera*); on *Acacia* sp., on rotten bark
Coriolopsis aspera	*Trametes badia*; substrate unknown
Coriolopsis caperata	(*Polyporus caperatus*); on *Symplocos* sp. & roots of *Ficus* sp.
Coriolopsis polyzona	*Polystictus occidentalis*; substrate unknown, on dead wood
Coriolopsis strumosa	*Polystictus aratus*; on *Acacia*, *Casuarina* & *Citrus* spp.
Coriolopsis strumosa	*Trametes (Polyporus) luteoolivacea*; on Niaouli wood
Coriolus flabellum	*Polyporus flabellum*; on dead logs
Coriolus lactineus	*Trametes lactinea*; on roots of *Melaleuca quinquenervia*
Cortinarius (Myxacium) necessarius	on soil among mosses under *Nothofagus* spp.
Cortinarius (Myxacium) neocaledonicus	on soil in cloud *Nothofagus* spp. forest
Cortinarius (Myxacium) verecundus	on soil in cloud *Nothofagus* spp. forest
Cotylidia aurantiaca	*Podoscypha aurantiaca*; on rooten lianas
Crepidotus aureus	on rotten bark, branches and logs in cloud *Nothofagus* forest
Crepidotus hirsutellus	on rotten bark, branches and logs in cloud *Nothofagus* forest
Crepidotus mollis	substrate unknown
Crinipellis elatus	on fallen leaves

Crinipellis carecomoeis	on fallen leaves of evergreen tree
Crinipellis mirabilis	on twigs
Crinipellis stipitarius	on rotting debris of verbenaceous plants
Cuphocybe ferruginea	on soil in cloud *Nothofagus* spp. forest
Cyathus gayanus	on dung of herbivores
Cyathus lesueuri	on dung of herbivores
Cyathus poeppigii	substrate unknown
Cyathus striatus	substrate unknown
Cyclomyces setiporus	*Favolus (Apus) transiens*; on tree trunks
Cyclomyces setiporus	(*Polyporus setiporus*); on bark of *Nothofagus* sp.
Cyclomyces setiporus	*Polystictus cichoriaceus*; on rotten wood in cloud forest
Cyclomyces tabacinus	*Polystictus tabacinus*; on rotten & living saxifragaeous spp.
Cymatoderma blumei	*Cladoderris blumei*; on *Acacia lebbeck*
Cymatoderma caperatum	*Stereum caperatum*; on dead logs
Cymatoderma elegans var. ***lamellatum***	*Stereum lamellatum*; on dead wood
Cymatoderma elegans var. ***lamellatum***	*Stereum spongiaepes*; substrate unknown
Cyptotrama asprata	*Lepiota asprata*; on rotten wood in coastal tropical forest
Cyptotrama chrysopepla	*Agaricus (Lepiota) echinodermatus*; probably on wood
Cystoagaricus strobilomyces	on wood and bark in cloud *Nothofagus* spp. forest

Dacryopinax spathularia	*Dacryomitra tenuis*; on wood
Dacryopinax spathularia	*Guepinia spathularia*; in cloud forest, on dead wood
Dacryopinax spathularia	*Guepiniopsis fissa*; on rotten wood
Daedalea aspera	*Lenzites aspera*; substrate unknown, on dead wood
Daedalea hydnopora	among debris on forest soil
Deflexula fascicularis	*Pterula fascicularis*; substrate unknown
Dictyophora indusiata	on the ground in old-burnt area with *Lantana* sp
Dictyophora indusiata	*Dictyophora bicampanulata*; on moist soil
Dictyophora indusiata	*Dictyophora phalloidea*; substrate unknown
Dictyophora speciosa	on soil

Elfvingia australis	*Ganoderma australe*; on tree trunks & *Monimia anisata*
Entoloma aromaticum	on soil in cloud *Nothofagus* spp. forest
Entoloma canobrunnescens	on soil in cloud *Nothofagus* spp. forest
Entoloma extraordinarium	on rotting wood in cloud forest
Entoloma floccosodentatum	on soil in cloud forest
Entoloma glaucopus	on soil among mosses in cloud forest
Entoloma haastii	on soil in cloud forest dominated
Entoloma mariae	on soil in cloud forest dominated by *Nothofagus*
Entoloma neocaledonicum	on rotten wood in cloud forest
Entoloma proprium	on soil or on rotten wood in cloud forest
Entoloma rotundisporum	on soil in cloud *Nothofagus* spp. forest
Entoloma serrulatum	on soil, coastal tropical forest
Entoloma translucidum	on soil in cloud *Nothofagus* spp. forest
Exidia fuliginea	on bark of trees in cloud forest

Favolaschia celebensis	Laschia celebensis; on roots of bamboo
Favolus tesselatus	substrate unknown
Filoboletus sp.	*Favolus nummularius*; substrate unknown

Filoboletus conus	on rotten log
Filoboletus manipularis	(*Favolus manipularis*); substrate unknown
Filoboletus manipularis	*Laschia caespitosa*; substrate unknown
Filoboletus manipularis	*Polyporus (Mesopus) mycenoides*; terrestrial ?
Filoboletus pustulosus	substrate unknown
Flavodon flavus	*Irpex flavus*; substrate unknown
Fomes insularis	*Ganoderma insulare*; substrate and date unknown
Fomes scruposus	*Phellinus scruposus*; on *Lantana* sp. log & substrate unknown
Fomitopsis semitostus	*Ungulina semitosta*; substrate unknown
Fulvifomes pectinata	*Fomes pectinatus*; on tree trunks, on living tree
Fulvifomes rimosus	*Xanthochrous rimosus*; on logs of *Milnea* sp.
Funalia ostreiformis	*Polyporus ostreiformis*; substrate unknown
Gallacea avellana	on fallen dead twigs in the forest
Ganoderma amboinense	on tree trunks, dead wood, logs and dead lianas
Ganoderma annulare	*Polyporus annularis*; substrate unknown
Ganoderma applanatum	*Lenzites applanata*; substrate unknown
Ganoderma applanatum	*Polyporus australis*; on rotten log
Ganoderma fasciatum	substrate unknown
Ganoderma lingua	on "geissois" wood
Ganoderma lucidum	parasitic on *Cocos nucifera*, on root
Ganoderma lucidum	*Polyporus lucidus*; substrate unknown
Ganoderma mangiferae	(*Polyporus mangiferae*); substrate unknown
Ganoderma sarasinii	*Ganoderma mastoporum*; substrate unknown
Gastroboletus doii	on soil in cloud forest dominated by *Nothofagus*
Geastrum badium	*Geastrum umbilicatum*; under *Lantana* sp. & *Melaleuca* sp.
Geastrum pectinatum	*Geastrum biplicatum*; on soil
Geastrum pectinatum	*Geastrum striatum* DC. var. *minor*; substrate unknown
Geastrum recolligens	*Geastrum lugubre*; on soil under *Lantana* & *Melaleuca* spp.
Geastrum saccatum	substrate unknown
Geastrum velutinum	substrate unknown
Geastrum velutinum	*Geastrum lloydii*; substrate unknown
Gloeophyllum trabeum	*Gloeophyllum striatum*; on rotten bark and wood of man
Gloeoporus chlorinus	*Merulius chlorinus*; on the hymenium of an old polypore
Gloiocephala epiphylla	on rotting leaves and debris of palm
Gymnopilus sapineus	*Flammula sapinea*, subsrate unknown
Heliomyces ? brevipes	on dead wood
Heterochaete léveilléi	on dead branches
Hexagonia amplexens	on dead branches of an *Acacia* sp.
Hexagonia casuarinae	on *Casuarina equisetifolia*
Hexagonia kurzii	substrate unknown
Hexagonia nigrocincta	on tree trunks
Hexagonia seurati	on tree trunks
Hexagonia tenuis forma ***nana***	on dead branches of *Acacia* sp.
Hirneola buccina	*Auricularia buccina*; on tree trunks
Hirschioporus friesii:	*Coriolus elongatus*; on wood & roots
Hydnum crocidens var. ***subexcentricum***	on tree trunks
Hymenochaete corticolor	on fallen branches

Hymenochaete perpusilla	substrate unknown
Hymenochaete sallei	substrate unknown
Hymenochaete villosa	on rotten bark
Hysterangium neocaledonicum	on soil in forest

Isaria (Clavaria) farinosa	*Ramaria farinosa*; on soil

Lachnocladium neglectum	substrate unknown
Laetiporus sulphureus	*Cladomeris sulphurea*; on tree trunks
Laschia cuticularis	on roots of bamboo
Lentinellus ursinus	*Lentinus hyracinus*; substrate unknown
Lentinus araucariae	on trunk of *Araucaria* sp.
Lentinus ciliatus	*Lentinus braccatus*; on *Araucaria cookei*
Lentinus ciliatus	*Lentinus echinopus*; substrate unknown
Lentinus ciliatus	*Lentinus setiger*; substrate unknown
Lentinus connatus	*Lentinus abnormis*; on rotten wood
Lentinus connatus	*Lentinus eradicatus*; on dead trunks
Lentinus connatus	*Lentinus revelatus*; substrate unknown
Lentinus fasciatus	substrate unknown
Lentinus fusipes	*Lentinus radicosus*; on trunks in iron-rich soil
Lentinus polychrous	on rotten wood
Lentinus sajor-caju	*Lentinus dactyliophorus*; on dead wood
Lentinus sajor-caju	*Lentinus exilis*; substrate unknown
Lentinus squarrosulus	substrate unknown
Lentinus striatulus	on rotten log
Lenzites elegans	*Lenzites (Daedalea) palisotii*; on *Coffea robusta*
Lenzites elegans	*Lenzites repanda*; on *Myoporum* sp. & rotten wood
Lenzites elegans	*Trametes muelleri*; on *Melaleuca quinquenervia* & *Cocos nucifera*
Lenzites marginata	substrate unknown
Lenzites platyphylla	substrate unknown
Lepiota atrata	on soil in cloud forest dominated by *Nothofagus*
Leptoporus rugulosus	*Polyporus rugulosus*; substrate unknown
Leratia atrovirens	on decaying leaves, on rotten wood
Leratia coccinea	substrate unknown
Leratia similis	on soil & dead wood in cloud *Nothofagus* forest
Leratia smaragdina	on trunk of rotten trees, on soil in cloud forest
Leucocoprinus cepaestipes	on sandy soil on beach
Leucofomes ulmarius	*Fomes ulmarius*; substrate unknown
Leucoporus agariceus	*Polyporellus agariceus*; substrate unknown
Loweoporus roseoalbus	on rotten bark of tree
Lycogalopsis solmsii	on rotten wood
Lycoperdon ericetorum	*Lycoperdon polymorphum*; on soil
Lycoperdon perlatum	*Lycoperdon gemmatum*; coastal tropical forest
Lycoperdon pyriforme	*L. acuminatum* var. *seuratii*; among mosses on *Artocarpus*
Lycoperdon scabrum	*Bovistella scabra*; on moist soil in forest

Marasmius amabilis	on decomposing cortex of *Monimia anisata*
Marasmius cylindraceocampanulatus	on rotting leaves in montane rain forest
Marasmius haematocephalus	substrate unknown

Marasmius haematocephalus	*Androsaceus rhodocephalus*; on *Lantana* sp.
Marasmius sulcatus	on wood, substrate unknown
Meiorganum neocaledonicum	on rotten log of *Agathis lanceolata*
Melanopus elegans	*Polyporus elegans*; on rotten wood
Melanotus flavolivens	on rotting bark in coastal forest, on plant debris,
Microporellus obovatus	on rotten wood, tropical forest
Microporus affinis	*Polyporus flabelliformis*; on *Montrouziera* sp.
Microporus flabelliformis	*Polystictus flabelliformis*; on rotten wood
M. flabell. v. crenatolobatus	*Polystictus flabelliformis* var. *crenatolobatus*; on wood
Microporus xanthopus	*Polystictus xanthopus*; on *Cupania* sp. & *Acacia* sp.
Mitremyces leratii	on soil in cloud *Nothofagus* spp. forest
Morganella samoensis	on wood
Morganella samoënsis	*Lycoperdon (Globaria) samoënse*; substrate unknown
Mycena chlorocephala	on soil, in cloud forest
Mycena irritans	on rotten wood, coastal tropical forest
Mycena odora	on rotten wood, tropical forest
Mycena pura	among decaying litter in cloud *Nothofagus* forest
Mycena rubidolimbata	on rotten wood
Mycena spinosissima	on rotting wood and bark of angiospermic tree
Mycena stylobates	on rotten wood
Mycena vulgaris	substrate unknown
Naematoloma neocaledonica:	on soil in cloud *Nothofagus* forest
Nigroporus durus	*Polyporus durus*; substrate unknown,
Nigroporus vinosus	on rotten wood of tree
Osmoporus proteus	substrate unknown.
Osmoporus strigatus	*Fomes strigatus*; substrate unknown, dead wood
Panaeolus campanulatus	on dung
Paxillus chalybaeus	on soil in cloud *Nothofagus* spp. forest
Phellinus discipes	*Trametes aratoides*; on dead wood, on *Cupania* sp.
Phellinus ferruginosus	on dead wood
Phellinus melanoporus	*Fomes melanoporus*; substrate unknown
Phellinus nigricans	*Fomes nigricans*; in cloud forest
Phellinus pachyphloeus	*Polyporus pachyphloeus*; on tree trunks
Phellinus rimosus	*Fomes rimosus*; on *Acacia spirorbis*
Phellinus senex	*Fomes senex*; on woody saxifragaceous plant
Phylacteria palmata	on soil, substrate unknown
Physisporinus viridans	*Ceriporia viridans*; on rotten wood
Piptoporus portentosus	*Ungulina spermolepidis* var. *pandani*; on *Pandanus* sp.
Piptoporus portentosus	substrate unknown
Pisolithus microcarpus	*Polysaccum microcarpum*; on loamy soil
Pisolithus tinctorius	*Polysaccum crassipes*; on bare soil
Pisolithus tinctorius	*Polysaccum pisocarpium*; on loamy soil
Pisolithus tinctorius	*Polysaccum pusillum*; on soil
Pleurotus lux	on forest soil
Pleurotus septicus	coastal tropical forest
Pleurotus stella	on decaying trunk

Pleurotus tahitensis	on dead trunk of *Pandanus* sp.
Podoscypha involuta	*Stereum involutum*; on dead *Cupania* sp.
Podoscypha mellisii	on rotten bark
Podoscypha venustula ssp. ***cuneata***	*Podoscypha affinis*; substrate unknown
Polyporellus agariceus	*Leucoporus agariceus*; substrate unknown
Polyporus arcularius	substrate unknown, on rotten wood
Polyporus asperulus	*Leucoporus asperulus*; on dead *Aleuritis* sp. trunk
Polyporus blanchetianus	substrate unknown
Polyporus grammocephalus var. ***favoloides***	on *Hibiscus tiliaceus*
Polyporus pancheri	on tree trunks
Polyporus pancheri	*Polyporus versiformis*: on tree trunks
Polyporus polychrous	on rotten wood, on dead wood
Polyporus stramineus	*Spongipellis stramineus*; tree trunk in humid forest
Polyporus virgatus	on rotten wood, tropical forest
Poria fumosa	substrate unknown
Poria hyposclera	substrate unknown
Porostereum umbrinoalutaceum	*Stereum (Lloydella) umbrinoalutaceum*; on wood
Psathyrella disseminata	substrate unknown
Pseudofavolus polygrammus	*Hexagonia polygramma*; on rotten *Casuarina* sp.
Pseudofavolus polygrammus	*Hexagonia rigida*; on living *Cupania* sp.
Pseudofavolus tenuis	*Hexagonia tenuis*; on rotten wood
Pterula capillaris	on *Juncus* sp. in swamp
Pulcherricium caeruleum	*Corticium caeruleum*; on dead wood
Pycnoporus cinnabarinus	*Trametes cinnabarina*; substrate unknown
Pycnoporus sanguineus	*Polystictus sanguineus*; on *Melaleuca quinquenervia* & wood
Pyrrhoglossum hepatizon	*Agaricus hepatizon*; on rotten wood
Pyrrhoglossum pyrrhum	*Agaricus pyrrhus*; on rotten wood

Ramariopsis fusiformis	*Clavaria fusiformis*; on ground in forest
Ramariopsis pulchella	*Clavariopsis pulchella* var. *lutescens*; on dead wood
Rozites neocaledonica	on soil among litter in cloud forest
Russula echinospora	*Russula echinospora*; on *Nothofagus* wood

Schizophyllum commune	on rotten trunks, on *Hibiscus tiliaceus*
Schizophyllum commune	*Schizophyllum alneum*; on debris of "bancoulier" & Acacia
Schizophyllum commune	*Schizophyllum commune* var. *flabellare*; on rotten trunks
Sclerodepsis meyenii	*Trametes obstinata*; on saxifragaceous plant
Scleroderma aurantium	*Scleroderma vulgare*; on soil,
Scleroderma geaster	on iron-rich soil
Scytinopogon angulisporus	*Clavaria sarasinii*; on soil, on forest soil
Stereum campaniforme	tree trunk
Stereum fasciatum	substrate unknown
Stereum latum	on wild *Citrus* sp.
Stereum lobatum	on rotten wood & tree trunks in the forest
Stereum neocaledonicum	on dead wood, on dead branches
Stereum ostrea	on rotting bark of branches
Stereum perlatum	on rotten wood in cloud forest
Stereum rimosum	on rotten wood in cloud forest, on dying tree
Stilbum subiculosum	on decaying bark of *Citrus aurantius*

Trametes atra	on tree trunks
Trametes blumei	*Polystictus gallopavonis*; substrate unknown
Trametes cornea	on rotten roots
Trametes decussata	on trunks of *Cocos nucifera*
Trametes elegans	*Lenzites elegans*; on rotten *Aleurites moluccana*
Trametes hirsuta	*Coriolus lutescens*; on dead "goyavier" & living *Myoporum*
Trametes hirsuta	*Polyporus hirsutus*; on tree trunks, *Myoporium* & *Casuarina* spp.
Trametes persoonii	*Polystictus persoonii*; on *Coffea,Theobroma*, *Casuarina* & *Acacia*
Trametes velutinus	*Coriolus velutinus*; on trunks of living trees
Trametes versicolor	*Coriolus versicolor*; on dead wood
Trametes villosa	*Boletus villosus*; on rotten bark of tree
Tremella fimbriata	*Tremella foliacea*; on dead wood
Tremella fuciformis	substrate unknown
Tremella samoensis	on rotten wood,
Trichaptum biforme	*Polyporus pergamenus*; on rotten wood
Trichaptum flavum	*Trametes flava*: on dead wood
Tyromyces citreus	*Polyporus citreus*; on rotten branches
Tyromyces grammocephalus	*Polyporus grammocephalus*; on "bancoulier" wood
Tyromyces rasipes	*Leucoporus rasipes*; on dead "bancoulier"
Tyromyces udus	*Polyporus fuscomaculatus*; substrate unknown

Ungulina contracta	(*Polyporus contractus*); on dead wood & myrtaceaous plants
Ungulina cubensis	(*Polyporus cubensis*); substrate unknown
Ungulina fasciata	(*Boletus fasciatus*); on living "azou"
Ungulina Le Rati	on dead wood
Ungulina obesa	on stems of *Cocos nucifera*
Ungulina polychroa	on *Ficus* sp.

Vararia rosulenta:	on dead branches of *Dacrydium araucarioides*
Vascellum curtissi	*Lycoperdon endotephrum*; moist soil in Niaouli forest
Vascellum curtissi	*Lycoperdon wrightii*; on soil
Volvariella taylori:	on rotten roots of *Musa* sp.
Volvariella volvacea:	on rotten roots of *Musa* sp.

Weraroa erythrocephala	*Secotium erythrocephalum*; in cloud forest

Xanthochrous bernieri:	on rotting trunks
Xanthochrous conchatus	*Phellinus conchatus*; on tree trunks, on myrtaceous tree
Xanthochrous niaouli	*Polyporus spermatolepidis*; on *Spermatolepis gemmifera*
Xanthochrous niaouli	on living *Melasperma quinquenervia*, on *Rhus atra*

MYCOTAXON

Volume LXVIII, pp. 131-136 July-September 1998

PERICONIA FUSIFORMIS ANAM. SP. NOV.

M. MUNTAÑOLA-CVETKOVIĆ, P. HOYO & A. GÓMEZ-BOLEA

Universitat de Barcelona, Facultat de Biologia, Av. Diagonal 645,
E- 08028 Barcelona,
E-mail: agomez @ porthos.bio.ub.es

Abstract

Periconia fusiformis is described as a new fungal anamorph species related to the group of congeneric taxa with setiform sterile apices. Its differential character is the compact conidiogenous part, which develops on all sides of the solitary stipes half way between the basal portion and the sterile apex giving the fructifications a spindle-like aspect. It was found on dead stem parts of *Brachypodium phoenicoides,* bordering a stream at 800 m altitude. Microscopic structures are illustrated with line drawings and SEM graphs.

Key words: *Brachypodium,* Graminaceous hosts, Saprobic fungi, Hyphomycetes, Catalonia, Spain.

Introduction

Species belonging in the anamorph genus *Periconia* have been seldom recorded for Spain. Muntañola-Cvetković, Hoyo & Llimona (1997) gave an account on this subject and reported nine species from Catalonia: *P. atra* Corda, *P. britannica* M.B. Ellis, *P. byssoides* Pers., *P. cookei* Mason & M.B. Ellis, *P. echinochloae* (Batista) M.B. Ellis, *P. hispidula* (Pers.: Pers.) Mason & M.B. Ellis, *P. lateralis* Ellis & Everh., *P. macrospinosa* Lefèbvre & Aar. G. Johnson, and *P. minutissima* Corda.

In another region of Spain (Cuenca, Castilla la Mancha), live plants of *Brachypodium phoenicoides* (L.) Roem. & Schultes were collected, with dead stem parts showing *Periconia* fructifications which did not fit those of any taxa described in this genus.

Material and Methods

Plants of *B. phoenicoides* were collected in August 1996 in a shady site bordering a stream near Villar del Humo (Cuenca, Castilla la Mancha) at 800 m altitude. The plant material was kept in four folders as exsiccata for subsequent mycological analysis. For SEM studies, selected fructifications on the host were air-dried, coated with gold and observed with a Hitachi 2300 SEM.

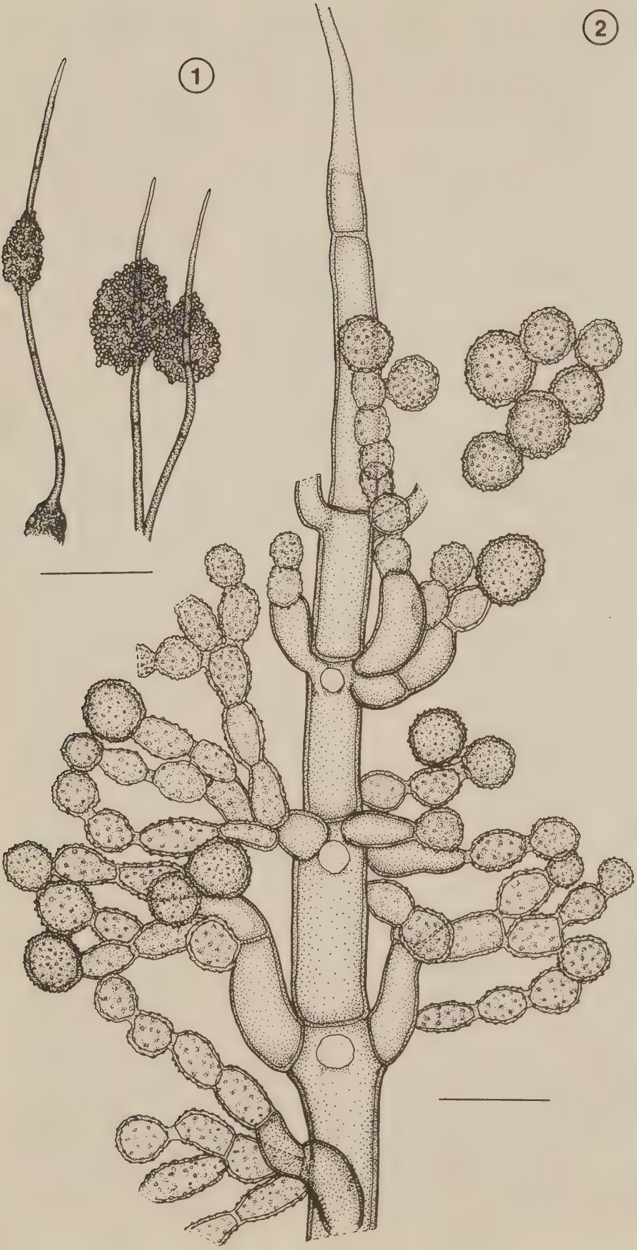
Taxonomy

A new species is proposed on morphometric grounds. It is here described under the latin binomial *Periconia fusiformis* Munt.-Cvet., Hoyo & Gómez-Bolea, referring to the spindle-like aspect of the fructifications.

Periconia fusiformis Munt.-Cvet., Hoyo & Gómez-Bolea (*ICONIS* 1-5)

Fructificationes *super hospitis substrato: erectae, fuscae, fusiformes, solitariae vel interdum numero 2-3 (-4) congregatae.* ***Conidiophora*** *macronematosa, mononematosa, e brunneo laevi septato stipite ramoso et fertili circa partem mediam, sed sterili et setiformi in apicali parte composita.* ***Stipes*** *420-1200 µm longis, 20-23 µm latus ad laeviter incrassatim basem et 4.5-6 µm latus ad setiformem apicem, septatus; septis inter se ad 120-130 µm inferne remotis, superne magis approximatis (usque ad 30-45 µm).* ***Ramuli*** *ex uterque lateribus stipitis partem mediam, subseptali, stipite concoloribus, parietibus laevibus, catenas ramosas cellularum sporogenarum (30-50 x 8-10 µm) producenti; aliquando unus lateralis setiformis ramus proveniens, 110 µm longus et 14 µm basi latus sub septos cum ramis communibus proveniens.* ***Cellulae conidiogenae*** *pallidae vel brunneae, ovales vel globosae vel subglobosae, verrucosae, 12.5-14.5 x 4-6.5 µm.* ***Conidia*** *in catenas basifugas saepe ramosas producta, sessilia, brunnea, sphaerica, pariete 1-1.5 µm crasso, verrucoso, unicellulata, ad maturitem (9-) 12 (-13) µm diametro.*

Fig. 1. *P. fusiformis* fructifications on the surface of a dead stem of *B. phoenicoides* (Scale bar = 200 µm). Fig. 2. Detail of a stipe near its middle part, showing septa, branches, conidiogenous cells and conidia. (Scale bar = 20 µm) (*Del.* M.M.-C. and P. Hoyo).


1
2

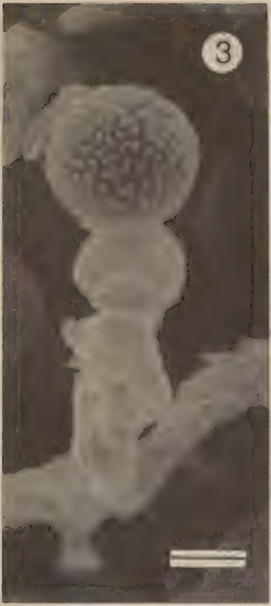
Typus *in emortuis partibus speciminum viventium* ***Brachypodii phoenicoidis*** (L.) Roem. & Schultes, *(Gramineae) ad Villar del Humo (Cuenca, Castilla-la Mancha)(UTM XK 11) die 28 augusti 1996 a Pilar Hoyo lectus et in Herbario barcinonense sub numero BCC Myc.MC401 servatus.*

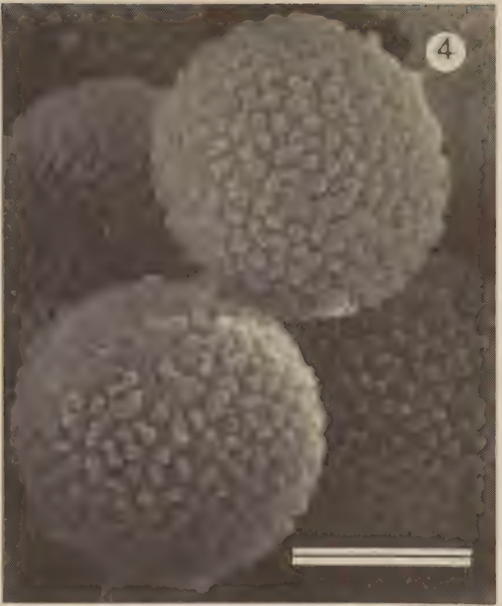
Periconia fusiformis Munt.-Cvet., Hoyo & Gómez-Bolea (Figs 1-5)

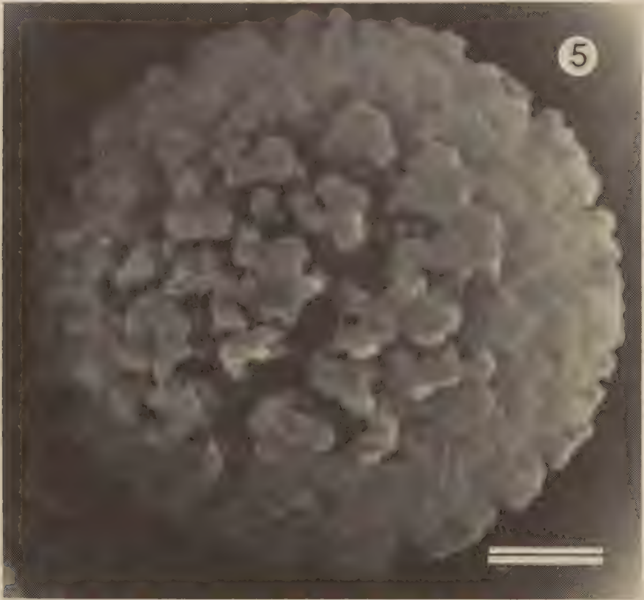
Conidiophores on the natural substrate: erect, dark, solitary or occasionally in groups of 2-3 (- 4), macronematous, mononematous, consisting of an erect, flexuous, sparsely septate stipe with a fertile branched middle part and a straight or flexuous sterile setiform apex, thick-walled. *Stipes* 420-1200 µm long, 20-23 µm wide at the slightly swollen base, immediately above 14.5-16 µm wide, gradually going down to 4.5-6 µm wide at the apex, septa 120-130 µm apart at the basal portion, then gradually closer, 30-45 µm at the setiform apex. *Branches* borne at about 240-600 µm height on all sides of the stipe and subverticillate in the middle part of the conidiogenous region, but sometimes also solitary distally, always subseptal, robust, adpressed, slightly recurved or sinuous, concolourous with the stipe, smooth-walled, septate, giving rise to a branching conidiogenous head, 30-50 x 8-10 µm; sometimes a sterile subulate septate lateral divergent setiform branch, up to 110 µm in length and 14 µm wide at the base (not illustrated), arises below septa together with fertile branches. *Conidiogenous cells* polyblastic, successive, discrete on stipe and branches, determinate, ellipsoidal, spherical or subspherical, broad to very narrow-based, verrucose, 12.5-14.5 x 4-6.5 µm. *Conidia* in often branched chains, arising acropetally at one or more points on the conidiogenous cells or parent conidia, sessile, spherical, brown, wall 1.3-1.6 µm thick, verrucose, 0-septate, (9.5-) 12 (-13) µm diam. when mature.

Type: On dead parts of living plants of *Brachypodium phoenicoides* (L.) Roem. & Schultes (Gramineae). Habitat: in grassland along the banks of a stream, Villar del Humo (Cuenca, Castilla la Mancha) (UTM 30-S XK11), 28th August 1996, leg. Pilar Hoyo. Deposited at the Herbarium of the University of Barcelona, BCC Myc. MC 401.

Figs. 3-5. SEM graphs of *P. fusiformis* showing conidiogenous cells (Fig. 3), moderately verrucose young conidia (Fig. 4), and a conspicuously verrucose mature conidium (Fig. 5). (Scale bars, Figs. 3 and 4 = 5 µm; Fig. 5 = 2 µm).


③


④


⑤

Discussion

The nature, size and morphology of the stipe apices, branching system and site where the conidiogenous cells and conidia are produced have been considered important characters in *Periconia* taxonomy (Ellis, 1971, 1976; Rao & Rao, 1964). *Periconia fusiformis* falls within the group of congeneric species in which the stipe has a setiform sterile apex. It is close to *P. lateralis*; both have solitary stipes, but in *P. fusiformis* the conidiogenous part develops on all sides of the stipe half way between the basal portion and the sterile apex, and the complex conidiogenous head gives the fructifications the appearance of a spinning top, whilst in *P. lateralis* conidia are formed only on one side of the stipe.

In *P. atropurpurea* (Berk. & Curt.) Litvinov the conidiophores are aggregated into pulvinate tufts, and the upper sterile part of the conidiophores, which is much shorter than the fertile lower one, is often recurved. As in *P. atropurpurea*, the colonies in *P. hispidula* are pulvinate, but contrary to this species the setiform portion of the stipes is usually longer than the fertile lower one. In *P. warticulata* (*sic!*) Rao & Rao the stipes are unbranched and strictly fertile only in the basal third region. There are five other taxa with stipes having sterile apices, but they also differ from *P. fusiformis* by several features. *P. kambakkamensis* Subram. has smooth, much smaller (4-6 µm diam.) conidia. In *P. ellisii* Rao & Rao the stipes are intricate and the apices coiled. The colonies of *P. madreeya* Subram. and *P. pseudohispidula* Rao & Rao are pulvinate, and those of *P. scrobiculata* Rao & Rao are flat and discoid, and the stipes unbranched (Rao & Rao, 1964).

Acknowledgemennts

The financial support given by the *Generalitat de Catalunya, Comissionat per a Universitats i Recerca* to M. M.-C. as a Visiting Research Professor is gratefully acknowledged. The authors are indebted to Prof. Dr. Josep Vigo (University of Barcelona) for his kind collaboration in the Latin diagnosis and to Dr. E. Descals for his critical review of the type-script.

References

ELLIS, M.B. 1971. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute: Kew.

ELLIS, M.B. 1976. More Dematiaceous Hyphomycetes. Commonwealth Mycological Institute: Kew.

MUNTAÑOLA-CVETKOVIĆ, M., HOYO, P., LLIMONA, X. 1997. Nou espècies de *Periconia* (fongs mitospòrics) de Catalunya. Rev. Catalana Micol. **20**: 233-244.

RAO, P. R. & RAO, D. 1964. The genus *Periconia* from India. Mycopath. Mycol. Appl. **22**: 285-310.

MYCOTAXON

Volume LXVIII, pp. 137-143 July-September 1998

TROPICAL HYPHOMYCETES OF MEXICO. III. SOME SPECIES FROM THE CALAKMUL BIOSPHERE RESERVE, CAMPECHE

GABRIELA HEREDIA ABARCA[1] and ANGEL MERCADO SIERRA[2]
[1]Instituto de Ecología, Apdo. Postal 63, Xalapa, Veracruz
91000 México.
[2]Instituto de Ecología y Sistemática, Ministerio de Ciencia, Tecnología y Medio
Ambiente, La Habana, Cuba.

ABSTRACT

This third contribution on the tropical microfungi of Mexico considers seventeen dematiaceous hyphomycetes collected in the Calakmul Biosphere Reserve in southeastern Mexico. Eleven species hitherto unknown from Mexico are described and six more previously recorded are listed. The species *Dischloridium tenuisporum*, *Periconiella anisophylleae*, and *Speiropsis simplex* are recorded for the first time beyond of their type locality.

Key words: Hyphomycetes, tropical fungi, Mexico, Campeche, Biosphere Reserve Calakmul.

INTRODUCTION

Continuing the series of papers on microfungi from tropical areas of Mexico, (Heredia *et al.*, 1997; Mercado, *et al.*, 1997), on this occasion some results of a revision of material collected in the Calakmul Biosphere Reserve are presented. The Calakmul Biosphere Reserve (CBR), is located in the State of Campeche, in southeastern Mexico. It is one of the largest tropical protected areas of Mexico, embracing an area of 723,185 ha. Topography consists of a flat-lying plain with some scattered elevations up to 380 m. The climate is hot and humid, with a mean annual temperature between 22-26° C. The northern area is hotter and drier than the southern area. Mean annual rainfall ranges from 1000 mm in the North to 1300 mm in the South. Several vegetation types are found in the Reserve. Around 60% of the CBR is covered by evergreen seasonal forest (Gómez-Pompa & Dirzo, 1995). This is the first account of hyphomycetes from the area.

METHODS

All the species were studied directly from naturally ocurring plant debris. Slides were mounted in lactophenol-cotton blue and polyvinyl alcohol. Specimens cited are deposited at the herbarium of the Instituto de Ecología (XAL) in Xalapa, Veracruz.

DESCRIPTION OF SPECIES

Beltraniella portoricensis (F. Stevens) Piroz. & S. D. Patil, *Can. J. Bot.* 48: 575. 1970.

Setae simple, erect, straight, thick-walled, coarsely verrucose, septate, mid to dark brown, arising from flat, radially lobed basal cells, up to 230 µm high, 6-9 µm wide at the base. **Conidiophores** unbranched, straight, subhyaline, smooth, 11-16 x 5-7 µm. **Conidiogenous cells** polyblastic, integrated and terminal, cylindrical or ampulliform, denticulate, separating cells limoniform, 10-11 x 3-4 µm. **Conidia** simple, straight, turbinate, with the distal free end truncate and the proximal end rostrate, pale olivaceous with a hyaline transverse band just above the center, 21-25 x 5-6 µm.
Material examined. On fallen decaying unidentified leaves. CB679-3. Coll. V. J. Sosa. 09-VI-94. Calakmul Archaeological zone. 18° 06′ 99″ N, 89° 48′ 99″ W. 250 m altitude.
Known distribution and substrata. *Beltraniella portoricensis* is a common fungus of leaf litter, it has a pantropical distribution (Pirozynski, 1963, Pirozynski & Patil, 1970; Grandi, 1985; Sutton, 1993).

Dischloridium tenuisporum Hol.-Jech., *Ceská Mykologie* 41(1): 31. 1987.

Colonies effuse, hairy, dark brown. **Conidiophores** fasciculate, cylindrical, straight or flexuous, unbranched, brown, paler toward the apex, septate, thick-walled, smooth, 125-226 x 4-5 µm. **Conidiogenous cells** enteroblastic, integrated, terminal, monophialidic, pale brown to hyaline, 20-35 x 3-4.5 µm in the broadest part. **Conidia** ellipsoidal to elongate ellipsoidal, aseptate, smooth, hyaline, guttulate, at the base truncate or with a small truncate papilla, 7-11 x 3.5-5.5 µm.
Material examined. Dead leaves of *Achras zapota*. CB671. Coll. V. J. Sosa. 03-IV-94. Central Chiclera Villahermosa. 17° 55′ 99″ N, 89° 41′ 99″ W. 275 m altitude.
Known distribution and substrata. Until now, *D. tenuisporum* was known only from Cuba growing on dead leaves of *Clusia rosea* (Holubová-Jechová, 1987; Holubová-Jechová & Mercado, 1989).

Grallomyces portoricensis F. Stevens, *Bot. Gaz.* 45: 245. 1918.

Colonies effuse, pale to mid olivaceous brown, arachnoid. **Mycelium** superficial, composed of slightly curved hyphal segments, olivaceous brown, minutely verruculose, 60-80 x 5-6 µm, each segment with a narrow, smooth, stalked attachment organ, 13-22 µm long and 2-2.5 µm wide, which terminates in a globose swelling 5-6 µm in diameter. **Conidiophores** unbranched, straight, olivaceous brown, smooth, 46 x 4-5 µm. **Conidiogenous cells** monoblastic, integrated, terminal, percurrent (up to 10 annellations), cylindrical, 4-8 x 4-5 µm. **Conidia** solitary, dry, acrogenous, branched, gently curved, brown, minutely verruculose, multiseptate, 50-65 x 5-6 µm, branches 25-35 µm long, each branch terminating in a stalked swollen attachment organ, 19-22 µm x 2.5-3 µm.
Material examined. On dead fallen unidentified leaves. CB678-1. Coll. V. J. Sosa. 16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.
Known distribution and substrata. According to the material examined by Deighton and Pirozynski (1966), the known distribution of this fungi is as follows: **America**: Brazil, British Guiana, Cuba, Dominican Republic, Hawaii, Puerto Rico, and Trinidad. **Asia**:

Philippines and New Guinea. **Africa**: Ghana (also recorded by Hughes, 1952) and Sierra Leone.

Grallomyces portoricensis is a foliicolous fungus, ocurring on living and dead leaves of a wide range of host plants. Deighton and Pirozynski (1966) presented a detailed description of *G. portoricensis*. Besides the long list of specimens examined by these authors (most of them from Herb. IMI), there are very few reports of this species cited in the literature.

Monodictys fluctuata (Tandon & Bilgrami) M. B. Ellis, *Mycol. Pap*. 125: 5. 1971.

Colonies effuse, velvety, pale to dark brown. **Conidiogenous cells** monoblastic, integrated, terminal. **Conidia** dry, many-celled, very variable in size and shape, oblong, round at the ends, constricted at the septa, smooth walled, dark golden brown, up to 32 µm in diameter.

Material examined. On orchid bulb. CB670. Coll. V. J. Sosa. 03-IV-94. Central Chiclera Villahermosa. 17° 55′ 99″ N, 89° 41′ 99″ W. 275 m altitude.

Ellis (1971b) pointed out that conidia in this species are at first smooth and later verruculose, but in our material mature conidia were smooth.

Known distribution and substrata. America: Cuba (Mercado, 1981; Holubová-Jechová & Mercado, 1989). **Africa**: Nigeria and Egypt. **Asia**: India and Pakistan. **Australasia**: Australia (Ellis, 1971b). This fungus has been isolated from air, kernels, soil and plant debris.

Monodictys lepraria (Berk.) M. B. Ellis, *More Dematiaceous Hyphomycetes,* p. 44. 1976.

Colonies effuse, farinose, blackish brown. **Conidiophores** micronematous flexuous, hyaline. **Conidiogenous cells** monoblastic, integrated, terminal. **Conidia** dry, many-celled, cylindrical to irregularly clavate or irregularly lobed, muriform, dark brown, smooth-walled, 52-95 x 53-69 µm.

Material examined. On rotten wood. CB673-2. Coll. V. J. Sosa. 03-IV-94. Central Chiclera Villahermosa. 17° 55′ 99″ N, 89° 41′ 99″ W. 275 m altitude.

Known distribution and substrata. America: Cuba (Holubová-Jechová & Mercado, 1984, 1989). **Asia**: India (Rao & Hoog, 1986). **Europe**: England (Ellis, 1976) and Hungary (Holubová-Jechová, 1979). This lignicolous fungus has been collected on rotten wood and dead branches of different trees such as *Quercus* spp. (Ellis, 1976), *Populus alba* and *P. nigra* (Holubová-Jechová, 1979).

Mycoenterolobium platysporum Goos, *Mycologia* 62: 171-175. 1970.

Colonies effused, black, shiny. **Mycelium** immersed to somewhat superficial. **Conidiophores** inconspicuous, hyaline or subhyaline, smooth, frequently absent. **Conidiogenous cells** monoblastic, integrated, determinate, cylindrical or subspherical. **Conidia** dictyospores, solitary, dry, acrogenous or pleurogenous, flattened in one plane, shiny, semi-circular to irregular in outline, smooth, muriform with rows of cells radiating fanwise from the hilum, 66-91 x 51-75 µm and 19-23 µm thick.

Material examined. On rotten wood. CB668. Coll. V. J. Sosa. 16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.

Known distribution and substrata. America: Cuba (Holubová-Jechová & Mercado, 1984, 1986; Mena & Mercado, 1987), USA (Chamuris, *et al*., 1985). **Asia**: Hawaii (Goos, 1970;

Goos & Uecker, 1992), India (Goos, pers. comm.; Chamuris, *et al*., 1985). This fungus is mainly wood-inhabiting. The type description refers a collection from decaying wood of *Araucaria* (Goos, 1970). Later, it was reported on an undetermined palm petiole (Mena & Mercado, 1987), on bark of dead *Acacia koa* (Goos & Uecker, 1992), and on various undetermined dead rotten trunks and branches.

Periconiella anisophylleae M. B. Ellis, *Mycol. Pap*. 111: 2-35. 1967.

Conidiophores composed of an erect, straight, blackish brown stipe and a complex head of branches bearing conidia. Stipes smooth, septate, up to 250 x 5-8 µm, branches cylindrical, subhyaline to pale brown, up to 40 x 2-4 µm. **Conidiogenous cells** polyblastic, integrated and terminal on stipe, cylindrical, with numerous conidial scars. **Conidia** acropleurogenous, usually solitary, elliptical, aseptate, hyaline to pale olivaceous brown, minutely verruculose, 4.5-7 x 2.5-3 µm wide at the broadest point.
Material examined. On dead fallen leaves. CB678-2. Coll. V. J. Sosa. 16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.
Known distribution and substrata. Hitherto probably known only from the type collection. **Africa**: Sierra Leone, collected on leaves of *Anisophyllea laurina* (Ellis, 1967).

Speiropsis simplex Matsush., *Microfungi of the Solomon Islands and Papua-New Guinea*, p. 56. 1971.

Conidiophores straight, septate, mid to dark brown, smooth, with short, pale branches at the apex, 50-80 x 4-8 µm. **Conidiogenous cells** formed at the end of the branches, polyblastic, determinate, clavate, with denticules in which conidia are formed, 8-11 x 3-5 µm. **Conidia** filiform, fusiform, hyaline, smooth, 6-8 celled (each cell 9-11 µm long) attached by a narrow isthmus, 70-82 x 3-4.5 µm.
Material examined. On dead fallen leaves. CB679-2. Coll. V. J. Sosa. 09-VI-94. Calakmul Archaeological zone.18° 06′ 99″ N, 89° 48′ 99″ W. 250 m altitude.
Known distribution and substrata. This represents the second report of the species since its description. **Asia**: Wau, Papua New Guinea, where it was collected on a bark of a broad-leaf tree (Matsushima, 1971).

Sporidesmium adscendens Berk., *Ann. Nat. Hist.* 4: 291. 1840.

Colonies black, effused. **Conidiophores** straight or slightly flexuous, mid to dark reddish brown, septate, 12-5 x 5-7 µm. **Conidiogenous cells** monoblastic, integrated, terminal, cylindrical, 5.5-6 x 4-6 µm. **Conidia** obclavate and greatly elongated, often constricted at the pseudosepta, rounded at the apex, conico-truncate at the base, mid to dark reddish brown, 35-57 pseudoseptate, 186-288 x 15-17 µm at the broadest point, 4-7 µm wide at the apex.
Material examined. On rotten wood. CB680. Coll. V. J. Sosa. 09-VI-94. Calakmul Archaeological zone.18° 06′ 99″ N, 89° 48′ 99″ W. 250 m altitude.
Known distribution and substrata. This is a cosmopolitan lignicolous fungus which has been collected on rotten wood and bark of dead branches and trunks of many different species of trees (Morris, 1978; Mercado, 1980; Holubová-Jechová & Mercado, 1986, 1989; Sutton, 1993; Mercado & Mena, 1995).

Taenionella subsessilis (Ellis & Everh.) S. Hughes, *Can. J. Bot.* 36: 817. 1958.

Mycelium partly superficial, partly immersed. **Conidiophores** caespitose, unbranched, flexuous, brown to dark brown, smooth, septate, 25-65 x 6-7 µm. **Conidiogenous cells** monoblastic, integrated, terminal, cylindrical or doliiform, 5-10 x 5-7 µm. **Conidia** commonly in long simple chains, mid to dark brown with 4-6 (mostly 5) transverse septa, the terminal cells paler than the other cells, 19-35 x 7-9 µm.
Material examined. On rotten wood. CB676. Coll. V. J. Sosa. 16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.
Known distribution and substrata. Hitherto probably known only from the type collection and Cuba. **America**: Cuba (Mercado & Mena, 1995) on dead branches, USA, on dead bark of *Smilax hispida* (Ellis, 1976).

Zygosporium masonii S. Hughes, *Mycol. Pap.* 44: 15-16. 1951.

Colonies effuse, grey to blackish. **Conidiophores** unbranched, erect, pale brown, 10-23 x 2 µm, bearing an erect chain of two to six vesicles, dark brown, 6-9 x 4-6 µm , and a hyaline sterile apical region which terminates in a small knob. **Conidiogenous cells** monoblastic, ampulliform, upwardly curved, hyaline 4-5 x 2-2.5 µm. **Conidia** dry, ellipsoidal, hyaline, 6-7 x 3-3.5 µm.
Material examined. On dead fallen leaves of *Cecropia* sp. CB677. Coll. V. J. Sosa. 03-IV-94. Central Chiclera Villahermosa. 17° 55′ 99″ N, 89° 41′ 99″ W. 275 m altitude.
Known distribution and substrata. *Z. masonii* is very common on herbaceous litter from tropical plants, soil and air (Hughes, 1951; Ellis, 1971). It was isolated before from Mexico in the coastal sand of Jalisco (González & Herrera, 1993). This is the first record for the State of Campeche.

OTHER SPECIES FOUND AND PREVIOUSLY RECORDED FROM MEXICO

Beltrania rhombica O. Penz., *Nuovo G. bot. ital.* 14: 72-75. 1882.
Material examined. On dead fallen leaves. CB679-1. Coll. V. J. Sosa. 09-VI-94. Calakmul Archaeological zone. 18° 06′ 99″ N, 89° 48′ 99″ W. 250 m altitude.

Hermatomyces sphaericum (Sacc.) S. Hughes, *Mycol. Pap.* 50: 100. 1953.
Material examined. On dead leaves of *Chamaedora* sp. CB669. Coll. V. J. Sosa. 03-IV-94. Central Chiclera Villahermosa. 17° 55′ 99″ N, 89° 41′ 99″ W. 275 m altitude.

Monodictys paradoxa (Corda) S. Hughes, *Can. J. Bot.* 36: 786. 1958.
Material examined. On rotten wood. CB681. Coll. V. J. Sosa. 16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.

Piricaudilum lobatum Hol.-Jech., *Ceská Mykologie* 42: 200-203. 1988.
Material examined. On dead fallen leaves of *Chamaedora* sp. CB674-1. Coll. V. J. Sosa. 16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.

Torula verrucospora (P. N. Mathur & R. D. Singh) B. Sutton, *Mycol. Pap.* 167: 67. 1993.
Material examined. On dead fallen leaves of *Chamaedora* sp. CB674-2. Coll. V. J. Sosa.

16-VI-94. Aguada del Refugio. 18° 48′ 99″ N, 89° 22′ 99″ W. 180 m altitude.

Zygosporium oscheoides Mont., *Ann. Sci. Nat., Paris, Sér.* 2, 77: 121. 1842.
Material examined. On dead fallen leaves of *Chamaedora* sp. and *Cecropia* sp. CB672; CB677. Coll. V. J. Sosa. 09-VI-94. Calakmul Archaeological zone.18° 06′ 99″ N, 89° 48′ 99″ W. 250 m altitude.

ACKNOWLEDGEMENTS

The authors express their gratitude to Dr. G. Bills who kindly provided a pre-submission review. We are especially grateful to Dr. R. P. Korf for his many helpful suggestions. We acknowledge financial support from the Instituto de Ecología from Xalapa (Project 902-07). We are indebted to Dr. Vinicio Sosa for collecting the plant material. Biol. Manuela Reyes provided technical assistence.

LITERATURE CITED

Chamuris, G. P., S. P. Falk., and J. K. Wang, 1985. *Denticularia limoniformis*, *Lemkea sphaerospora* and *Mycoenterolobium platysporum* (Hyphomycetes): New records for North America. *Mycotaxon* 24: 319-324.

Deighton, F. C., and K. A. Pirozynski, 1966. Microfungi. II: *Brooksia* and *Grallomyces*; *Acrogenotheca ornata* sp. nov.; The genus *Xenosporium*. *Mycol. Pap.* 105: 10-17.

Ellis, M. B., 1967. Dematiaceous Hyphomycetes. VIII. *Mycol. Pap.* 111: 7-9.

Ellis, M. B., 1971. *Dematiaceous Hyphomycetes*. Commonwealth Mycological Institute, Kew, England.

Ellis, M. B., 1971b. Dematiaceous Hyphomycetes. X. *Mycol. Pap.* 125: 4-5.

Ellis, M. B., 1976. *More Dematiaceous Hyphomycetes*. Commonwealth Mycological Institute, Kew, England.

Gómez- Pompa, A., and R. Dirzo, 1995. *Reservas de la Biosfera y otras áreas naturales protegidas de México*. Edit. SEMARNAP, INE, CONABIO. México, D.F. 159p.

González, M. C., and T. Herrera, 1993. Micromicetes endopsamófilos de Barra de Navidad, Jalisco, México. *Rev. Mex. Mic.* 9: 19-33.

Goos, R. D., 1970. A new genus of the hyphomycetes from Hawaii. *Mycologia* 62: 171-175.

Goos, R. D., and F. A. Uecker, 1992. New species and additional records of fungi from Hawaii. *Mycologia* 84(3): 322-328.

Grandi, R. A. P., 1985. Hyphomycetes do Estado de Sâo Paulo. 1. Especies do Cerrado da Reserva Biológica de Moji-Guaçu. *Rickia* 12: 125-145.

Heredia, G., A. Mercado Sierra, J. Mena Portales, and M. Reyes, 1997. Tropical hyphomycetes of Mexico II. Some species from the tropical biology station “Los Tuxtlas”, Veracruz, Mexico. *Mycotaxon* 64: 203-223.

Holubová-Jechová, V., 1979. Lignicolous and some other saprophytic Hyphomycetes from Hungary. *Ceská Mykologie* 33: 137-149.

Holubová-Jechová, V., 1987. Studies on hyphomycetes from Cuba V. Six new species of dematiaceous hyphomycetes from Havana province. *Ceská Mykologie* 41 (1): 29-36.

Holubová-Jechová, V., and A. Mercado Sierra, 1984. Studies on hyphomycetes from Cuba II. Hyphomycetes from the Isla de la Juventud. *Ceská Mykologie* 38 (2): 96-120.

Holubová-Jechová, V., and A. Mercado Sierra, 1986. Studies on hyphomycetes from Cuba IV. Dematiaceous hyphomycetes from the Province Pinar del Rio. *Ceská Mykologie* 40 (3): 142-164.

Holubová-Jechová, V., and A. Mercado Sierra, 1989. Hyphomycetes from Loma de la Coca and some localities of La Habana and Matanzas provinces, Cuba. *Acta Bot. Cubana* 76: 1-15.

Hughes, S. J., 1951. Studies on micro-fungi. X. *Zygosporium. Mycol. Pap*. 44: 1-18.

Hughes, S. J., 1952. Fungi from the Gold Coast. I. *Mycol. Pap*. 48: 1-91.

Matsushima, T., 1971. *Microfungi of the Solomon Islands and Papua-New Guinea.* Published by the author. Kobe.

Mena Portales, J., and A. Mercado Sierra, 1987. Algunos hifomicetes de las provincias Ciudad de la Habana y La Habana, Cuba. *Rep. de Inv. del Inst. de Ecol. y Sist. Academia de Ciencias de Cuba* 17: 1-17.

Mercado Sierra, A., 1980. Hifomicetes demaciáceos de Cuba (1). *Acta Bot. Cubana* 1: 1-5.

Mercado Sierra, A., 1981. Lista preliminar de Hifomicetes demaciáceos de la Estación Ecológica de Sierra del Rosario y zonas adyacentes. *Acta Bot. Cubana* 6: 1-6.

Mercado Sierra, A., and J. Mena Portales, 1995. Hifomycetes dematiáceos de tres provincias orientales de Cuba. *Rev. Iberoam. Micol*. 12: 101-107.

Mercado Sierra, A., G. Heredia, and J. Mena Portales, 1997. Tropical hyphomycetes of Mexico I. New species of *Hemicorynespora*, *Piricauda* and *Rhinocladium*. *Mycotaxon* 63: 155-167.

Morris, E. F., 1978. Belizean hyphomycetes. *Mycotaxon* 7: 265-274.

Pirozynski, K. A., 1963. *Beltrania* and related genera. *Mycol. Pap*. 90: 16-23.

Pirozynski, K. A. and S. D. Patil, 1970. Some setose hyphomycetes of leaf litter in South India. *Can. J. Bot.* 48: 567-581.

Rao, V., and G. S. De Hoog, 1986. New or critical hyphomycetes from India. *Studies in Mycol*. 28: 1-84.

Sutton, B. C., 1993. Mitosporic fungi from Malawi. *Mycol. Pap*. 167: 93.

MYCOTAXON
Volume LXVIII, pp. 145-155 July-September 1998

ARBORILLUS LLIMONAE NOV. GEN. ET SP., A SYNNEMATOUS LICHENICOLOUS HYPHOMYCETE

M. MUNTAÑOLA-CVETKOVIĆ & A. GÓMEZ-BOLEA

Universitat de Barcelona, Facultat de Biologia, Av. Diagonal 645,
E-08028 Barcelona
E-mail: agomez@porthos.bio.ub.es

Abstract. *Arborillus llimonae,* described as a new synnematous hyphomycetous genus and species, was found on the lichen *Diploschistes diacapsis* growing on a gypsaceous soil in central Catalonia, Spain. Ecological information is given. The distinctly verrucose, penicillate, monophialidic conidiogenous cells and the catenate, verrucose, ellipsoidal conidia are illustrated with DIC and SEM graphs and compared with those of *Doratomyces nanus*.

Key words: Taxonomy, Hyphomycetes, synnematous fungi, lichenicolous fungi, *Arborillus*, *Diploschistes diacapsis, Doratomyces nanus.*

INTRODUCTION

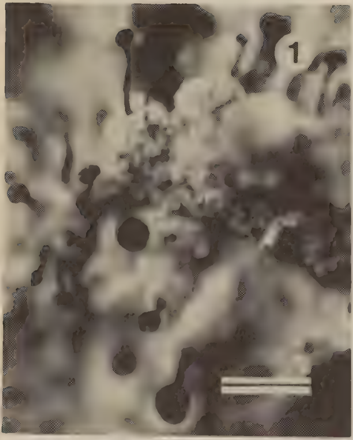
On May 1996 a pretty synnematous fungus was found by Prof. Xavier Llimona on the lichen *Diploschistes diacapsis* (Ach.) Lumbsch growing on a gypsaceous soil in Torà de Riubregós (central Catalonia, Spain). Because of the habitat and the aspect of the capitate fructifications under field examination with a hand lens (Fig. 1), it was brought to the laboratory with the assumption that it could belong in *Leightoniomyces* D. Hawksw. & B. Sutton, a dematiaceous genus with capitate synnemata, created to accomodate *Doratomyces phillipsii* (Berk. & Leight.) F.J. Morton & G. Smith (Hawksworth, 1977), initially described in *Periconia* Tode. Because of some superficial similarity with *P. nana* Ehrenb., which Morton & Smith (1963) also transferred to *Doratomyces*, the conidiogenous cells and conidium ornamentation of this species were examined by SEM in order to make comparisons with the fungus found on *Diploschistes*. The fine structure of *D. nanus* annellophores had already been studied by Hammill (1971).

MATERIAL AND METHODS

Samples were submitted to the routine mycological techniques using bright field and DIC (differential interference contrast) optical systems. SEM (scannig electron microscopy) studies were performed following the usual methods of air-drying and coating with gold, and observations made with a Hitachi 2300.

The following exsiccata were loaned by Herb. IMI: Ex-type material of *Leightoniomyces phillipsii* (Berk. & Leight.) D. Hawksw. & B. Sutton [IMI 49180 (slide) on *Thrombium epigaeum* (Pers.) Wallr. on damp soil, Leighton coll., May 1874]; *Doratomyces nanus* (Ehrenb.) F. J. Morton & G. Smith, IMI 252909 (*det.* M. B. Ellis), and IMI 229547 (*det.* D. W. Minter). The original material of *Periconia nana* was obtained from Herb. HAL.

Figs. 1-4. Various structures of *Arborillus llimonae* (BCC.Myc.MC169). Fig.1. Low magnification micrograph of synnemata on the natural substrate. Fig. 2. Bright field micrograph of a synnema. Fig. 3. Penicillate conidiogenous cells. Fig. 4. Successive basipetal conidial production from the open end of a conidiogenous cell (arrow). (Figs. 3 and 4, with DIC optics). (Scale bars Fig. 1 = 1 mm, Fig. 2 = 100 µm, Figs. 3 and 4 = 10 µm).


1

2

3

4

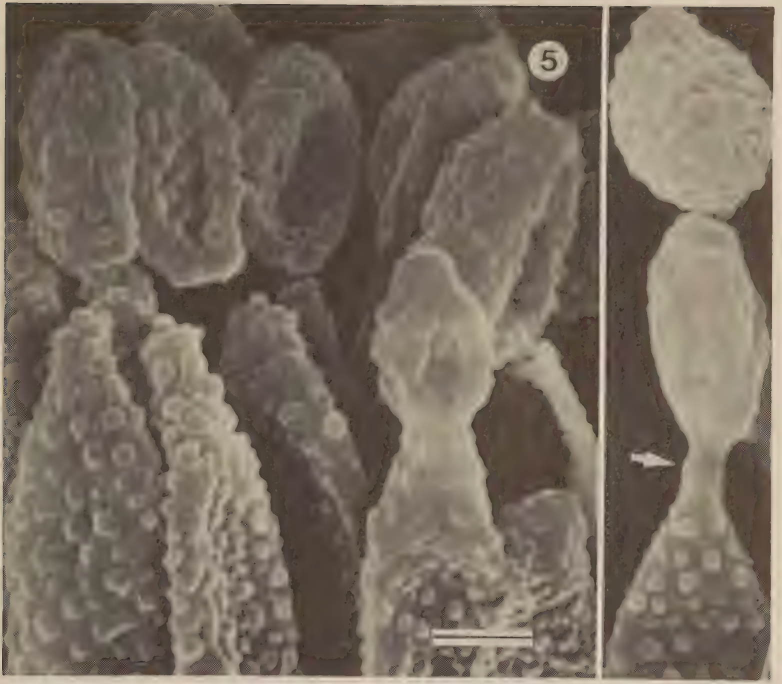
RESULTS AND DISCUSSION

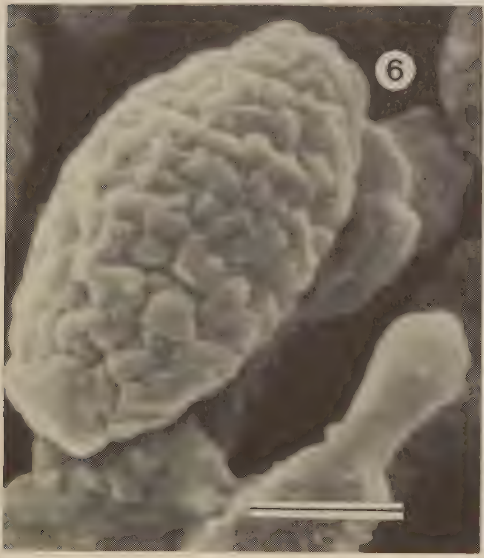
When observed with a hand-lens, fructifications looking like round-headed pins on the substrate are found in some dematiaceous genera such as *Periconia, Doratomyces* and *Leightoniomyces.* However, microscopical preparations reveal essential differences as for the nature of these tree-like structures. Conidiophores in *Periconia* are single "trunks", whereas in *Doratomyces* and *Leightoniomyces* they form synnemata. In the fungus found on *Diploschistes* conidiomata are also synnematal (Figs. 2 and 3), but other features exclude it from *Leightoniomyces* and *Doratomyces*, the two genera closest to our fungus. This refers principally to conidium ontogeny.

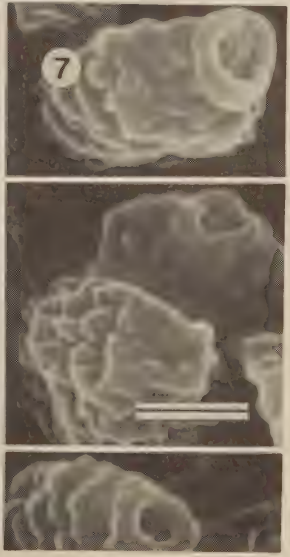
In the fungus on *Diploschistes* the first conidium undergoes holoblastic ontogeny, a septum is then laid down, and by enteroblastic monophialidic proliferation of the conidiogenous cell new conidia are formed and delimited, so that the youngest conidium is to be found in the bottom of an unbranched conidial chain (Figs. 3, 4 and 5). Secession is schizolytic, and a broad scar is visible at the truncate base of the ellipsoidal or elongate-ellipsoidal verrucose conidia (Figs. 6 and 7). Conidiogenous cells can repeat this sequence many times, remaining of the same length.

The ex-type material of *L. phillipsii* consists of a very old slide on which a side view of the head shows the arrangement of the conidiogenous cells and some globose, coarsely verrucose conidia, 8.8-10.4 µm. It corresponds to the illustrations presented by Hawksworth (1977, plate 1E) and confirms the dissimilarities of this fungus with ours. In *Leightoniomyces* the conidiogenous cells are annellidic, so that conidia are produced at progressively higher levels.

Figs. 5-7. SEM graphs of several structures of *Arborillus llimonae* (BCC Myc.MC169). Fig. 5. Verrucose conidiogenous cells and conidia. At the right, a short conidial chain, with the oldest conidium at the top; the arrow points to the basal delimitation of the second conidium, which is in process of schizolytic dehiscence from the conidiogenous cell. Fig. 6. Conidium showing its verrucose surface and polar scars. Fig. 7. Conidia showing their polar scars. (Scale bars = 1 µm).


5


6


7

The not catenate globose conidia show a point of attachment described by D. Hawksworth & B. Sutton (Hawksworth, 1977) as a scar resembling a hyaline pore, which is similar to what we have called a polar scar in our fungus.

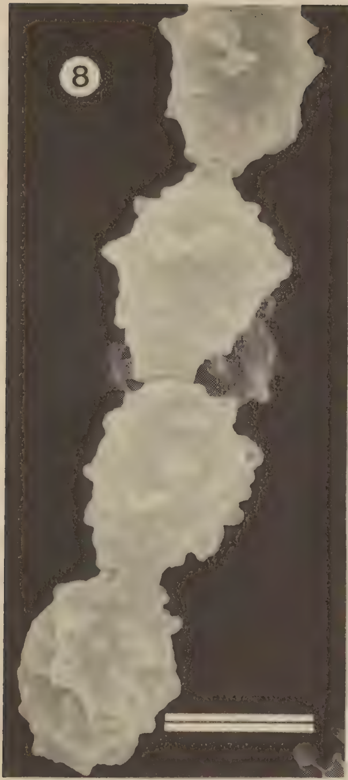
The genus *Doratomyces sensu* Morton & Smith (1963) has *Cephalotrichum* Link as a synonym (*fide* Kendrick & Carmichael, 1973; Arx, 1981), a controversial viewpoint challenged by Hughes (1958), Conway & Kimbrough (1975) and others. In any case these synnematal anamorph genera have blastic-percurrent conidium ontogeny (Hawksworth *et al.,* 1995), so that several ring-like scars left by the secession of previous conidia are clearly visible on the conidiogenous cells, as has been seen in the material of *D. nanus* we have examined (Fig. 10).

The presence of a wide basal scar on the conidia, similar to that in our fungus, is also evident in *D. nanus* (Fig. 9). As for conidial ornamentation, in the fungus on *Diploschistes* the wall is moderately warted; in *D. nanus* it is markedly verrucose with verrucae rather conoid; in *L. phillipsii* the wall is coarsely verrucose and verrucae are angular.

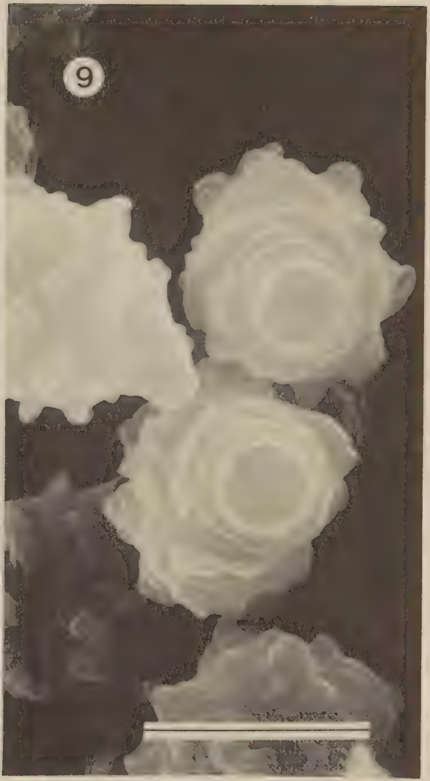
Whereas the difference in conidiogenesis between *Leightoniomyces* and *Doratomyces* is rather one of degree (Hawksworth, 1977), the fungus on *Diploschistes*, with holoblastic conidial ontogeny and enteroblastic phialidic cell proliferation, differs fundamentally because the annellidic mode, not seen in our fungus, is a generic character in *Doratomyces* (Ellis, 1971) and *Leightoniomyces* (Hawksworth, 1977).

We consider that the features of the fungus on *Diploschistes* warrant the establishment of a new genus and species, for which the binomial ***Arborillus llimonae*** Munt.-Cvet. & Gómez-Bolea is proposed.

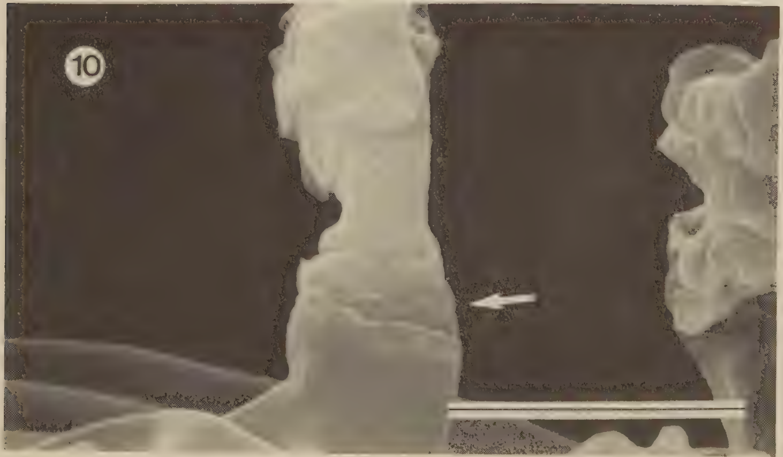
Figs. 8-10. *Doratomyces nanus* (IMI 252909). Fig. 8. A chain of conspicuously verrucose conidia. Fig. 9. Conidia showing their broad polar scars. Fig. 10. Several annellations on a conidiogenous cell. (Scale bars = 5 μm).



⑧



⑨



⑩

Arborillus Munt.-Cvet. & Gómez-Bolea, anam. gen. nov.

DERIVATIO: *Arbor* + *illus* (from Latin, *arbor,* tree + the suffix diminutive *illus,* small; because of the small tree-like aspect of the fructifications).

TYPUS GENERIS: ***Arborillus llimonae*** Munt.-Cvet. & Gómez-Bolea

TELEOMORPHOSIS: Ignota.

Deuteromycotina. *Ad fungos conidiales, synnematosae Hyphomycetes pertinens. Conidiophora macronematosa, erecta, synnemata, brunnea, apices expansa et capituliformia. Cellulae conidiogenae monophialidicae, penicillatae, terminaliter integratae, cum parietibus verrucosis. Conidia catenata, sicca, non-septata, verrucosa, truncata, cum lata cicatrice in polis.*

Deuteromycotina, synnematous Hyphomycetes. *Conidiophores*, synnematous, brown, branching in the upper capitate part. *Conidiogenous cells* monophialidic, penicillate, terminal, integrated, with verrucose walls. *Conidia* catenate, dry, non-septate, verrucose, with a detachment scar resembling a pore at the truncate poles.

TYPE SPECIES: ***Arborillus llimonae*** Munt.-Cvet. & Gómez-Bolea

TELEOMORPHOSIS: Unknown.

Arborillus llimonae Munt.-Cvet. & Gómez-Bolea anam. sp. nov.

DERIVATIO: A *Llimona* (from the surname of Dr. Xavier Llimona, Professor at the University of Barcelona, Spain, and collector of the specimen).

ICONES: Figs. 1-7.

TYPUS: *A Prof. Xavier Llimona lectus, die 10 mensis Maius 1996, et in Herbario barcinonense sub numero BCC Myc. MC169 servatus.*

SUBSTRATUM: *Diploschistes diacapsis* (Ach.) Lumbsch. (Thelotremataceae, lichenized Ascomycetes).

LOCUS TYPICUS: *Hispania, centralis Catalonia*, Torà de Riubregós, UTM 31T CG63.

Synnemata super naturalem hospitem similia atroviridibus acibus, 500-1000 x 25-100 µm, composita erectis et flexuosis hyphis cum laevis parietibus, pallide fuscis, et capite viridescente subellipsoideo, 175-400 µm latitudine. Conidiophora synnematosa, fusco-rubescentia, a maturitate obscuriora, superne irregulariter et repetite ramosa. Cellulae conidiogenae penicillatae, ad ramulos apicales conidiophororum locatae, parallele et dense disposite, holoblasticae, monophialidicae, lageniformes, ad apices attenuatae, manifeste verrucosae, 12-17 x 2.5 µm. Conidia catenata, sicca, ellipsoidalia, cum apice rotundato et base truncata, vel utrimque truncata, cum parietibus multo verrucosis, viridescentia, cum lata cicatrice in polis, non-septata, 2.3-4.5 x 2.5 µm.

Arborillus llimonae Munt.-Cvet. & Gómez-Bolea anam. sp. nov. (Figs. 1-7)

ETYMOLOGY: After Dr. Xavier Llimona, Professor at the University of Barcelona (Spain), collector of the specimen.

TYPE: On the lichen *Diploschistes diacapsis* (Ach.) Lumbsch, growing on a gypsaceous soil in Torà de Riubregós (Barcelona, Spain), UTM 31T CG63, coll. X. Llimona, May 10, 1996, BCC Myc Herb. MC169.

Synnemata on the natural host: looking like greenish-black pins, 500-1000 x 25-100 µm, composed of intricate, individually pale brown, smooth hyphal threads, which at the apices splay out to form a roughly transversely ellipsoidal head, 175-400 µm broad, black with green reflections. *Conidiophores* synnematous, reddish brown, darkening with age, irregularly and repeatedly branched in the upper part. *Conidiogenous cells* penicillate on the ultimate branches of the conidiophores, producing a monophialidic basipetal succession of conidia without any change in length of the conidiogenous cell, lageniform, verrucose, 12-17 x 2.5 µm. *Conidia* dry, in chains, the youngest conidium at the bottom, separating by schizolysis, ellipsoidal, apex rounded and base truncate, or both ends truncate depending on the position of the conidium in the chain, detachment scar 0.7 µm diam., walls coarsely verrucose, greenish, turning brownish in old lactophenol preparations, 2.3-4.5 x 2.5 µm.

ECOLOGICAL REMARKS

According to Prof. X. Llimona (pers. comm.), the white gypsum outcrops of Torà belong in the Oligocene and are located along the road from Calaf to Ponts, in a rather dry (550 mm rainfall) and continental climate. The vegetation is composed of the gypsicolous shrubs *Ononis tridentata* L. and *Gypsophila struthium* L. subsp. *hispanica* (Willk.) G. López, and of a very dispersed thicket of *Helianthemum squamatum* (L.) Pers., *H. syriacum* (Jacq.) Dum.-Cours. subsp. *thibaudii* (Pers.) Meikle, *Artemisia herba-alba* Turra, etc.

The type locality is a 1-3 m^2 surface, with an 80-40° slope, facing south. The soil is rather shallow, with saccharoid and crystalline gypsum outcrops. The free surface is mostly covered by *Diploschistes diacapsis* (45%). *Acarospora reagens* Zahlbr., *Psora saviczii* (Tomin) Follmann & Crespo, *Squamarina lentigera* (Weber) Poelt are some other components of this lichen community, which matches well with an impoverished stand of the association *Acarosporetum placodiiformi-reagentis* Llimona (Llimona, 1974; Casares-Porcel & Gutiérrez-Carretero, 1993).

Since 1970 this area has been explored many times (Llimona, 1974), but the species here described was never observed until the end of spring 1996, an unusually rainy season. The fructifications of *Arborillus* were then seen with a hand lens emerging in groups like little greenish pins or minute nails from the thalli of *D. diacapsis,* which were apparently undamaged but rather poor in apothecia. July 10th. 1996 some stalked synnemata were still present. In the next fall only minute pits in the cortex of previously invaded lichens could be seen.

Attempts were made to keep the thalli collected in the *locus typicus*, in a moist chamber, but no new synnemata were formed.

ACKNOWLEDGEMENTS

This study was funded by the *Institut d'Estudis Catalans*, to which the authors are indebted. M.M.-C. is grateful to the *Generalitat de Catalunya, Direcció d'Universitats i Recerca*, for funding her sojourn in the University of Barcelona as a Visiting Research Professor. Thanks are addressed to the Curators of the Herbaria IMI (International Mycological Institute, U.K.) and HAL (Martin Luther-Universität, Germany), for lending exsiccata. The disposal of the Electron Microscopy Service of the Univ. of Barcelona is gratefully recognized. Appreciation is expressed to Profs. J. Vigo and J. Vaqué for their attention to many questions; to P. Hoyo for her assistance in the laboratory, and to J. Vila for the photograph in Fig. 1. Dr. E. Descals is sincerely thanked for his critical review of the typescript.

REFERENCES

Arx, J. A. von 1981. Genera of fungi sporulating in pure culture. 3rd. Ed. 424 pp. J. Cramer, Vaduz.

Casares-Porcel, M., & L. Gutiérrez-Carretero. 1993. Síntesis de la vegetación liquénica gipsícola termo- y mesomediterránea de la Península Ibérica. Cryptog. Bryol. Lichenol. **14**: 361-388.

Conway, K.E. & J.W. Kimbrough. 1975. A new *Doratomyces* from water hyacinth. Mycotaxon **2**: 127-131.

Ellis, M.B. 1971. Dematiaceous Hyphomycetes. Kew, Comm. Mycol. Inst., 608 pp.

Hammill, T.M. 1971. Fine structures of annellophores. II. *Doratomyces nanus*. Trans. Br. Mycol. Soc. **59**: 249-253.

Hawksworth, D.L. 1977. Three new genera of lichenicolous fungi. Bot. J. Linnean Soc. **75**: 195-209.

Hawksworth, D.L., P.M. Kirk, B.C. Sutton & D.N. Pegler. 1995. Ainsworth & Bisby's Dictionary of the Fungi. 8th Ed., Intn. Mycol. Inst., U.K., 616 pp.

Hughes, S.J. 1958. Revisiones hyphomycetum aliquot cum appendice de nominibus rejiciendis. Can. J. Bot. **36**: 727-836.

Kendrick, B. & J. W. Carmichael. 1973. Hyphomycetes. *In* The Whole Fungus. Vol. I, pp. 323-509 (Eds. Ainsworth, G.C., Sparrow, F.K. & Sussman, A.S.), Acad. Press, NY.

Llimona, X. 1974. Las comunidades de líquenes de los yesos de España. Resumen de Tesis. Univ. Barcelona, 18 pp. Barcelona.

Morton, F.J. & G. Smith. 1963. The genera *Scopulariopsis* Bainier, *Microascus* Zukal, and *Doratomyces* Corda. Mycol. Pap. **86**: 1-96.

MYCOTAXON

Volume LXVIII, pp. 157-164 July-September 1998

SCHIZOPORA TRAMETOIDES SP. NOV. A TRIMITIC DIMIDIATE SPECIES FROM SUMATRA

Suhirman
Botanical Gardens of Indonesia, Jl. Ir. Juanda 13, P.O. Box 309,
Bogor 16003, Indonesia
and
Maria Núñez
Department of Botany, Division of Biology, University of Oslo,
Blindern, P.O. Box 1045, N-0316 Oslo 3, Norway.

Abstract

Schizopora trametoides Núñez nov. sp. is described from Sumatra characterized by dimidiate basidiocarps and a trimitic hyphal system. The taxonomic position of the genus is discussed.

Introduction

The poroid genus *Schizopora* Vel. emend. Donk is microscopically well characterized by its thick-walled generative hyphae with hyphodontioid branching (Langer 1994), capitate hyphal ends, and encrusted hyphae in the dissepiments. Within some species, basidiocarps may vary from subpileate to effused-reflexed and resupinate, and the hymenophore configuration from poroid to hydnoid-irpicoid (Hallenberg 1983, Gilbertson & Ryvarden 1987, Niemelä 1987). Interspecific differences are based on basidiospore size and shape (Buchanan & Ryvarden 1988), hymenophore configuration (Hjortstam & Ryvarden 1984), cystidia morphology (David & Rajchenberg 1992), and hyphal system (Hallenberg op. cit., Gilbertson & Ryvarden op.

cit.). Langer (1994) only accepts pseudodimitic to dimitic species in the genus, and combines the monomitic species in *Hyphodontia* emend. Langer. Recently, a proposal has been made to conserve the name *Hyphodontia* in favour of *Schizopora*, since the latter has priority over *Hyphodontia* (Langer et al, 1996).

Schizopora has been placed in Corticiaceae because of its close microstructural resemblance to genera like *Fibrodontia* Parmasto and *Hyphodontia* J. Erikss. (Eriksson et al. 1984). The three genera also share a continuous dolipore parenthesome (Langer 1994).

A new species from Sumatra, *Schizopora trametoides*, is described here, with dimidiate basidiocarps and a trimitic hyphal system.

***Schizopora trametoides* Núñez, sp. nov.**

Holotype: Bukit Perkas, Jambi province, Sumatra, Indonesia, 1080 m.a.s.l., on dead hardwood, 30.5.1995, MN839(O). Isotype in BO.

Pilei 6 cm radio, sessiles, applanati, aliquando pede brevi resupinato, glabri, sulcati, pallide ochracei, ad basim verrucosi. Tubi 2 mm longi, cremei, poris 3 per mm, dissepimentis dentato-irpicoideis vel labyrinthiformis. Caro 1 mm crassa, coriacea. Systema hyphale trimiticum, hyphis generatoris crassitunicatis, fibulatis, in aculeis incrustatis disposita vel hyphis capitatis 18-20 x 4-7 µm, hyphis skeleticis crassitunicatis, raro ramosis, hyphae ligativae copiosae, crassitunicatae, ramulis furcatis. Sporae albae, tenuetunicatae, subellipsoideae, (4)4.5-5 x 2-2.5 µm. Ad truncos delapsos in silva Sumatrae.

Basidiocarps annual, pileate, solitary or in pairs, broadly dimidiate or with a tapering base, sometimes with a resupinate part extending on the substrate, pilei up to 6 cm long and wide

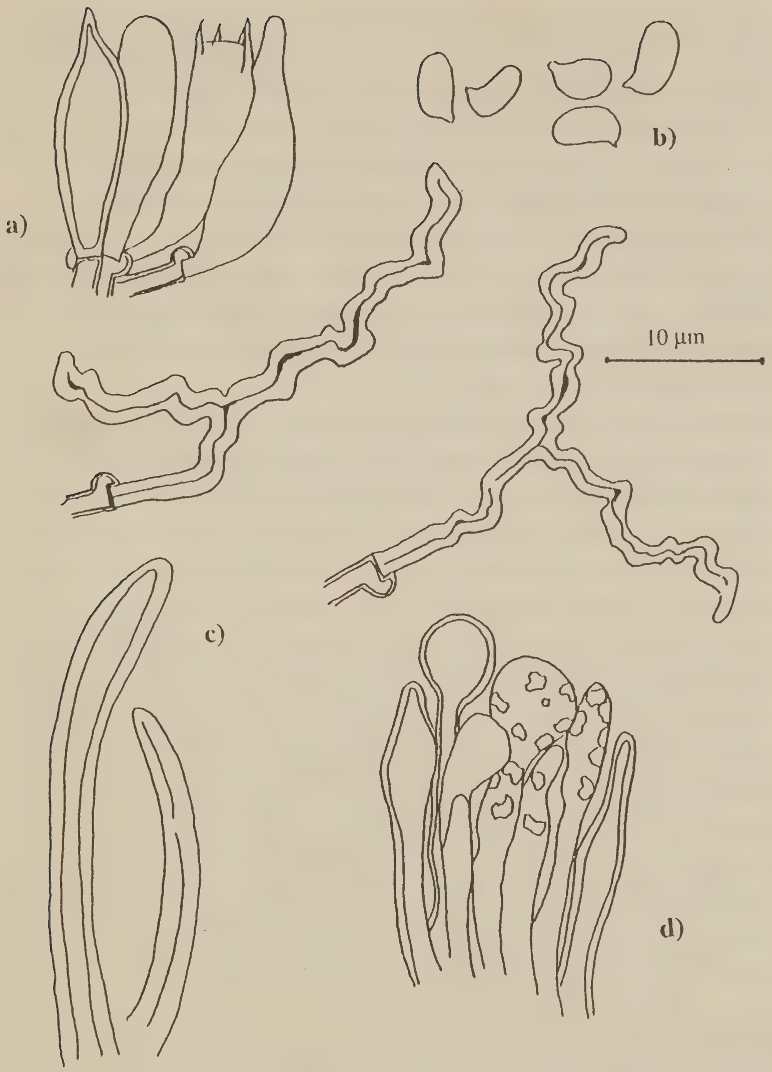


Fig. 1. *Schizopora trametoides*: a) part of the hymenium with mucronate and mammillate cystidiols, b) basidiospores, c) binding hyphae, d) skeletal hyphae, e) dissepiments with capitate and encrusted hyphae.

and 2 mm thick, coriaceous to flexible when dry, upper surface glossy in incident light, white to cream-coloured, darkening to ochraceous from the base when dry, slightly broadly concentrically zonate and radially striate, some basidiocarps with warted outgrowths lighter than the pileus, otherwise glabrous, margin lobed as if formed by several fused pilei, deflexed when dry. Hymenophore poroid, pores 3 per mm with dentate dissepiments, the pores soon lacerate and then up to 1-2 pores per mm. Pore surface pale straw-coloured with a weak orange tint. Context white, up to 1 mm thick, homogeneous, concolorous with the tubes.

Hyphal system trimitic, generative hyphae thick-walled, with a lumen, hyaline, up to 2.5 µm, with prominent clamps and hyphodontioid branching. Skeletal hyphae thick-walled, solid, straight and unbranched, pointed at the tip, yellowish, up to 5 µm wide in the trama and 8 µm in the context and pilear surface. Binding hyphae thick-walled, solid, tortuous and branched, arising from a clamp, up to 3 µm wide in the trama and 3.5 µm in the context. Pilear surface a cutis formed by parallel skeletal hyphae intermingled with few generative and binding hyphae. Dissepiments formed by straight skeletal and generative hyphae, these encrusted at the tips, some of them capitate.

Basidia clavate, thin-walled, 15-18 x 4-5 µm, 4-sterigmate. Hymenial cystidiols present, thick-walled, mucronate to mammillate, 20-22 x 4-5 µm, not protruding, several capitate, 18-20 x 4-7 µm. Basidiospores subellipsoid, hyaline, smooth, (4)4.5-5 x 2-2.5 µm, negative in Melzer's reagent.

Remarks - *Schizopora trametoides* looks like a *Trametes* species at first sight, but the identity of the fungus is readily revealed by the thick-walled generative hyphae with hyphodontioid branching and prominent clamps, encrusted dissepiments, capitate cystidiols, and hyaline, subellipsoid basidiospores. No other known species in the genus has a trimitic hyphal system.

Pileate basidiocarps and complex hyphal systems are considered as advanced evolutionary characters in polypores (Ryvarden 1993), although reduction of basidiocarps towards simplification is also considered an evolutionary trend (Oberwinkler 1985). Under the first hypothesis, *S. trametoides* would be the most advanced species in the genus. We do not know in which direction evolution has occurred for *Schizopora* species, as fossil records of the group are completely unknown. Angiosperm fossil records show that the highest number of primitive taxa in the world are presently found in South East Asian tropical forests (Raven & Axelrod 1974), where *S. trametoides* was collected. However, angiosperm and fungal evolution are not necessarily linked.

DISCUSSION

The concept of monomitic, pseudodimitic, and dimitic hyphal systems in *Schizopora* is different among authors. While Hallenberg (1983) and Niemelä (1987) consider *S. flavipora* and *S. radula* to be monomitic, Langer (1994) considers both species as pseudodimitic, and combines the species that he describes as monomitic in the genus *Hyphodontia.*

Although microstructural affinities between *Hyphodontia* and *Schizopora* are widely accepted, there are no examples of dimidiate, trimitic species as *S. trametoides* in Corticiaceae. Moreover, the species described here reminds of tropical specimens of *Trichaptum biformis* (Fr.) Ryv. (Polyporaceae) by its whitish, zonate basidiocarps and irregularly poroid to irpicoid hymenophore. It is worth reminding that *Trichaptum* species share with *Schizopora* a pileate to resupinate habit, encrusted cystidia and hyaline, smooth, ellipsoid basidiospores (Gilbertson & Ryvarden 1987). Moreover, both genera have a continuous dolipore parenthesome (Traquair & McKeen 1978, Rajchenberg

& Bianchinotti 1992, Langer 1994), a character widely used to establish phylogenetic relationships in other fungal groups (Moore 1985). To us, the presence of a poroid hymenophore combined with a gradually more complex hyphal system are the best characters to delimit the genus *Schizopora* against other hyphodontioid species. Hitherto, neither pileate basidiocarps nor binding hyphae are known in smooth or irpicoid species with hyphodontioid microstructure.

The similarity in macro-, micromorphology, and ultrastructure in *Hyphodontia*, *Schizopora*, and *Trichaptum* may point to an evolutionary line that crosses the borderlines between Corticiaceae and Polyporaceae as classically understood. Similar examples are found in Boletaceae, a family that now includes both mushrooms and false-truffles (Bruns 1989), and in the present circumscription of Polyporaceae that includes both gilled and poroid species (Hibbett & Virgalis 1991). We are convinced that modern techniques, and not the least, further insight on tropical taxa will cast light towards a more natural fungal taxonomy based on a phylogenetic approach.

Acknowledgements: The Indonesian Institute of Sciences (LIPI) and the Indonesian Botanical Gardens are thanked for making possible a botanical expedition to Sumatra. All members of the expedition are thanked for their logistic help. Discussions with E. Langer, L. Ryvarden, and K.H. Larsson are deeply acknowledged. K.H. Larsson has kindly reviewed this manuscript for publication.

Literature cited

Bruns T.D., Fogel R., White T.J. & Palmer J.D. 1989. Accelerated evolution of a false-truffle from a mushroom ancestor. Nature 339: 140-142.

Buchanan P.K. & Ryvarden L. 1988. Type studies in the Polyporaceae 18. Species described by G.H. Cunningham. Mycotaxon 31: 1-38.

David A. & Rajchenberg M. 1992. West African polypores: new species and combinations. Mycotaxon 45: 131-148.

Eriksson J., Hjortstam K. & Ryvarden L. 1984. The Corticiaceae of North Europe 7. *Schizopora-Suillosporium.* Fungiflora, Oslo.

Gilbertson R.L. & Ryvarden L. 1987. North American Polypores 2. Fungiflora, Oslo.

Hallenberg N. 1983. On the *Schizopora paradoxa* complex (Basidiomycetes). Mycotaxon 18: 303-313.

Hibbett D.S. & Virgalis R. 1991. Evolutionary relationships of *Lentinus* to the Polyporaceae: evidence from restriction analysis of enzymatically amplified ribosomal DNA. Mycologia 83: 425-439.

Hjortstam K. & Ryvarden L. 1984. Some new and noteworthy basidiomycetes (Aphyllophorales) from Nepal. Mycotaxon 20: 133-151.

Langer E. 1994. Die Gattung *Hyphodontia* John Eriksson. Bibl. Mycol. 154: 1-298.

Langer E., Hallenberg N., Knudsen H., Kõljalg U., Langer G., Larsson K.H., Oberwinkler F., Parmasto E., Ryvarden L. & Vesterholt J. 1996. Proposal to reject the names *Xylodon* and *Schizopora* in favour of *Hyphodontia*, nom. cons. (Fungi, Corticiaceae). Taxon 45: 685-686.

Moore R.T. 1985. The challenge of the dolipore parenthesome septum. In: Developmental biology of higher fungi. Ed. D. Moore, L.A. Casselton, D.A. Wood & J.C. Frankland: 175-212. Cambridge University Press.

Niemelä T. 1987. The raduloid species of *Schizopora.* Beih. sur Kenn. del Pilz. Mitt. 3: 365-370.

Oberwinkler F. 1985. Anmerkungen zur Evolution und Systematik der Basidiomyceten. Bot. Jahrb. Syst. 107: 541-580.

Rajchenberg M. & Bianchinotti M.V. 1992. On the presence of imperforate parenthesomes in *Daedalea sprucei* and its taxonomical disposition. Mycol. Res. 96: 956-958.

Raven P.H. & Axelrod D.I. 1974. Angiosperm biogeography and past continental movements. Ann. Miss. Bot. Gard. 61: 539-657.

Ryvarden L. 1993. Genera of Polypores. Nomenclature and taxonomy. Fungiflora, Oslo.

Traquair J.A. & McKeen W.E. 1978. Ultrastructure of the dolipore-parenthesome septum in *Hirschioporus pargamenus*. Can. J. Microbiol. 24: 767-771.

MYCOTAXON

Volume LXVIII, pp. 165-184 July-September 1998

ENTROPHOSPORA BALTICA SP. NOV. AND GLOMUS FUEGIANUM, TWO SPECIES IN THE GLOMALES FROM POLAND

Janusz Błaszkowski, Tadeusz Madej
and Mariusz Tadych

Department of Plant Pathology
Academy of Agriculture
Słowackiego 17, PL–71434 Szczecin, Poland

Abstract

Two fungal species, *Entrophospora baltica* sp. nov. and *Glomus fuegianum* (Glomales, Zygomycetes), are described and illustrated. *Entrophospora baltica* forms orange, (110–)177(–200) µm diam spores within the neck of sporiferous saccule. The spores and sporiferous saccules are enveloped in a sinuate hyphal mantle. Spore wall structure consists of five walls in two groups. Group A is composed of a hyaline, evanescent outermost wall, an orange, unit wall ornamented with warts, and a hyaline, laminated wall. A hyaline, membranous wall and a hyaline, coriaceous wall form group B. *Entrophospora baltica* occurred among roots of plants colonizing maritime sand dunes in northwestern Poland. *Glomus fuegianum* produces clusters of spores occurring singly in the soil or aggregated in sporocarps. Spore–groups are composed of radially arranged spores developed from a thick–walled, inflated hypha. The pale yellow to brown spores frequently are enveloped by branched and convoluted hyphae. Spores have one wall with two layers: a hyaline, sloughing outer layer adherent to a colored, laminated layer. *Glomus fuegianum* seems to be an extremely rarely occurring fungus in Poland. This fungus was recovered from three soil samples collected from the root zone of *Juniperus communis* growing in the inland sand dunes of the Kampinos National Park. This fungus is new to the mycota of Poland.

Key Words: *Entrophospora*, Glomales, *Glomus*, sand dunes, taxonomy, Zygomycetes

Introduction

During investigations of the occurrence of arbuscular mycorrhizal fungi in Poland, two earlier unrecorded fungi were recovered from beneath plants colonizing sand dunes. One of them is described here as *Entrophospora baltica*, sp. nov.

Materials and Methods

Collection of soil and root samples, as well as establishment of trap and single–species pot cultures were made as previously described (Błaszkowski, 1997a). The host plants used were *Plantago lanceolata* L., *Sorghum sudanense* (Staph.) Piper, and *S. vulgare* Pers. Plants were grown in a greenhouse at 18–30°C with supplemental 16–h lighting provided by one SON–T AGRO sodic lamp (Philips Lighting Poland S. A.) placed 1 m above pots. The maximum light intensity was 180 μE $m^{-2}s^{-1}$ at pot level. Plants were watered 2–3 times a week. Trap cultures were harvested at *ca* 1–mo intervals, beginning 5 months and ending 12 months after plant emergence. Spores were extracted by wet sieving and decanting (Gerdemann and Nicolson, 1963). Roots were stained in 0.05% trypan blue (Phillips and Hayman, 1970) and examined for the presence of mycorrhizae.

Because single–species cultures failed, morphological investigations of both fungi were performed on field–collected specimens and those coming from trap cultures. At least 100 sporocarps or spores of each species mounted in polyvinyl alcohol/lactic acid/glycerol (PVLG; Koske and Tessier, 1983) were examined. Additionally, *ca* 20 specimens of each fungus were investigated in a mixture of PVLG and Melzer's reagent (1:1, v/v). Specimens for scanning electron microscopy examination were fixed in 3% glutaraldehyde in a 0.02 M phosphate buffer (pH 6). They were then dehydrated in a graded ethanol series: 30, 50, 80 and 100%, critical point dried, mounted on aluminum stubs, and coated with gold. Wall characteristics of spores and terminology are those suggested by Franke and Morton (1994) and Spain *et al.* (1989) in respect to *Glomus fuegianum*, and Walker (1983, 1986) in respect to *E. baltica*. Although no ontogenetic investigations of *Glomus fuegianum* were conducted, results of Błaszkowski's (1997a), Błaszkowski and Tadych's (1997), Morton's (1996), Stürmer and Morton's (1997) studies suggest that subcellular structures of spores of all *Glomus* spp. are components of one spore wall, termed wall layers. Spore color was examined under a dissecting microscope on fresh specimens immersed in water. Color names are from Kornerup and Wanscher (1983). Specimens have been mounted on slides in PVLG and deposited in the Department of Plant Pathology (DPP), Academy of Agriculture, Szczecin, Poland. Specimens of the newly described species are also placed in the herbarium at Oregon State University (OSC), USA. Nomenclature of other fungi follows Almeida and Schenck (1990) and Walker and Trappe (1993). The classification is that of Morton and Benny (1990).

Descriptions and Discussions

Entrophospora baltica Błaszkowski, Madej & Tadych *sp. nov.*
Figs. 1–6

Sporocarpia ignota. Sporae singulae in solo efformatae, intra sacculum sporangiferum gestae. Sporae pallide aurantiacae vel aurantiacae; globosae vel subglobosae; (110–)177(–200) µm diam; aliquando ovoideae; 135–210 x 170–240 µm. Sporae at sacculi cum tunica e hyphis sinuosis, hyalinis vel pallide luteis, 2.5–10 µm latis, e tunicis 1–2 µm crassis; tunica rufa in solutione

Melzeri. Tunica sporae e stratis quinque (1–5) in turmis duabus (A, B). Turma externa e stratis tribus (strati 1–3); uno caduco, hyalino, (1.5–)2.0(–2.5) µm crasso; duobus rigido, pallide aurantiaco vel aurantiaco, (1.1–)1.3(–1.7) µm crasso, e verrucis, 0.6–0.8 µm altis; tribus laminato, hyalino, (1.5–)2.1(–2.7) µm crasso. Turma interna e stratis duabus (strati 4, 5); quarto membranaceo, hyalino, (0.5–)1.0(–1.3) µm crasso; quinque coriaceo, hyalino, (2.1–)2.7(–3.3) µm crasso. Sacculus sporangifer hyalinus vel pallide luteus; globosus vel subglobosus; (100–)170(–210) µm diam.

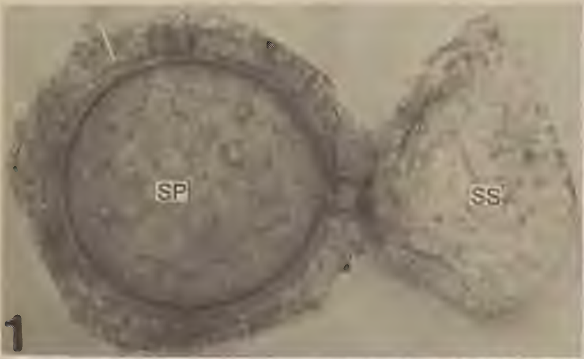
HOLOTYPUS. Poland. Świnoujście, infra *Ammophila arenaria* Link, 1 Oct. 91, *Błaszkowski, J., 2148* (DPP).

Sporocarps unknown. Spores formed singly in the soil, within the neck of a sporiferous saccule (Fig. 1).

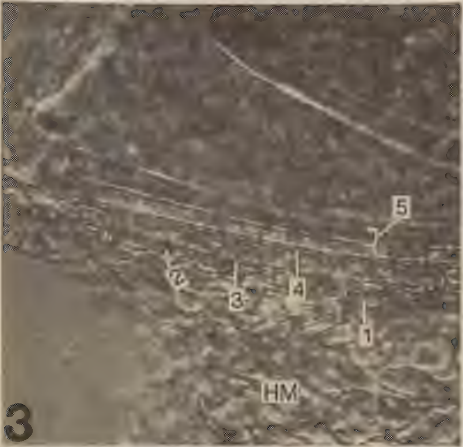
Spores pale orange (6A3) to orange (6A8); globose to subglobose; (110–)177(–220) µm diam; sometimes ovoid, 135–210 x 170–240 µm. Spores and sometimes sporiferous saccules covered with a hyphal mantle (Figs. 1, 3, 4). Hyaline, globose to subglobose, 18–22.5 µm diam *Glomus*–like vesicles infrequently associated with a hyphal mantle (Fig. 6).

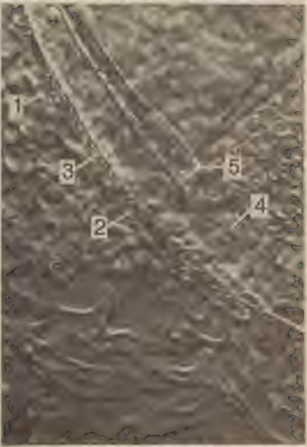
Mantle hyaline to pale yellow (3A3), 10–40 µm thick, composed of hyaline to pale yellow (3A3) interwoven, sinuous hyphae, 2.5–10 µm wide, with walls 1–2 µm thick (Figs. 1, 3, 4); staining lake red (9C8) in Melzer's reagent.

Figs. 1–6. *Entrophospora baltica*. **1.** Spore (SP) with sporiferous saccule (SS). Hyphal mantle (HM) and wall 1 are seen. Bright–field microscopy (BFM), x198. **2.** Some conical warts are arrowed. Scanning electron microscopy (SEM), x876. **3** and **4.** Spore walls 1–5 and hyphal mantle (HM). Differential interference contrast (DIC), x811. **5.** Spore surface in plan view (DIC), x986. **6.** *Glomus*–like vesicle associated with hyphal mantle (DIC), x986.

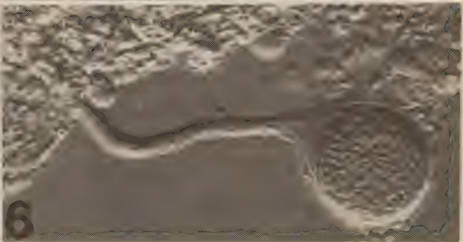

SP
SS
1

2


5
2
3
4
1
HM
3


1
3
5
4
2

5


6

Spore wall structure (Figs. 1, 3–5) of five walls (1–5) in two groups (A, B). Group A consisting of three adherent walls (walls 1–3). Wall 1 evanescent, hyaline, (1.5–)2.0(–2.5) µm thick. Wall 2 unit, pale orange (3A3) to orange (6A8), (1.1–)1.3(–1.7) µm thick, ornamented with evenly distributed warts, 0.6–0.8 µm high (Figs. 2, 5). Wall 3 laminated, hyaline, (1.5–)2.1(–2.7) µm thick. Group B consisting of two separable hyaline walls (walls 4, 5). Wall 4 membranous, (0.5–)1.0(–1.3) µm thick. Wall 5 coriaceous, (2.1–)2.7(–3.3) µm thick.

Sporiferous saccule hyaline to pale yellow (3A3); globose to subglobose; (100–)170(–210) µm diam. *Saccule wall* of a granular, hyaline, 0.5–0.8 µm thick outer layer adherent to a smooth, hyaline inner layer, *ca.* 1 µm thick. Spores occasionally with a cylindric or funnel-shaped stalk projecting into the sporiferous saccule and with a short subtending hypha, usually present at the opposite the saccule. *Stalk* maize yellow (4A6) to deep yellow (4A8); 10–70 µm long, 15–35 µm wide at the spore base, broadened up to 112 µm when funnel-shaped, with laminated walls, 3.4–3.9 µm thick; stalk surrounding a hole, 15–32.5 µm diam. *Subtending hypha* pale yellow (4A3); 15–25 µm long, 13–16 µm wide at the spore base, with walls 2.8–3.7 µm thick at the spore base. Saccule collapsing at maturity. Spores and saccule not reacting in Melzer's reagent.

DISTRIBUTION AND HABITAT. *Entrophospora baltica* was recovered from six soil samples taken under three plant species growing in maritime sand dunes adjacent to Świnoujście in northwestern Poland (53°55'N, 14°14'E). Examination of over 600 other samples of dune soils and almost 600 soil samples from under non-dune uncultivated and cultivated plants did not reveal spores of this fungus. The plants associated with *E. baltica* were *A. arenaria, Artemisia campestris* L., and *Petasites spurius* (Retz.) Rchb. The spore abundance of *E. baltica* in the six soil samples in which this new fungus occurred ranged from 1 to 70 (mean 27.17) in 100 g dry soil. The proportion of *E. baltica* spores in the whole populations of recovered spores of arbuscular fungi ranged from 0.37 to 56.9% (mean 17.52%). The arbuscular mycorrhizal fungal species richness in samples containing *E. baltica* ranged from 2 to 5 (mean 3.0) in 100 g dry soil. Other species of arbuscular fungi isolated with *E. baltica* were an undescribed *Acaulospora* sp., *Glomus aggregatum* Schenck & Smith emend Koske, *G. constrictum* Trappe, *G. corymbiforme* Błaszk., *G. etunicatum* Becker & Gerd., *G. fasciculatum* (Thaxter) Gerd. & Trappe emend. Walker & Koske, *G. macrocarpum* Tul. & Tul., *G. mosseae* (Nicol. & Gerd.) Gerd. & Trappe, *G. pustulatum* Koske et al., *G. rubiforme* (Gerd. & Trappe) Almeida & Schenck, and an undescribed *Glomus* sp.

The soil chemical properties of the dunes adjacent to Świnoujście are: pH, 3.8–6.7; NO_3 (mg L^{-1}), 20–72; P, 5–12; K, 2–26; Mg, 10–41; Na, 4–23; Cl, 15–25; KCl, 0.1–0.6; organic C (%), 0.1–1.1 (Błaszkowski, 1995).

MYCORRHIZAL ASSOCIATIONS. *Entrophospora baltica* was associated with vesicular–arbuscular mycorrhizae of *A. arenaria* and *P. spurius*. The fungus failed to form mycorrhizae in pot cultures with *S. sudanense* and *P. lanceolata.*

ETYMOLOGY. Latin, *baltica*, referring to the Baltic Sea to which the dunes harboring this fungus adhere. We wish to dedicate this species to Prof. Dr. Hab. Janina Jasnowska, a prominent biologist and the former head of the Department of Botany, Academy of Agriculture, Szczecin.

COLLECTIONS EXAMINED. HOLOTYPE. POLAND. Świnoujście, under *A. arenaria*, 1 Oct. 1991, *Błaszkowski, J., 2148* (DPP); isotypes: *Błaszkowski, J., 2149–2170* (DPP) and two slides at OSC.

OTHER MATERIALS EXAMINED. POLAND. Świnoujście, under *P. spurius*, 1 Oct. 1991, *Błaszkowski, J., unnumbered collections* (DPP).

Spores of *E. baltica* are distinctive in being enveloped in a sinuate hyphal mantle and having a unique wall structure. The mantle consists of tightly interwoven thin–walled hyphae that evenly cover the spores and sometimes occur on the sporiferous saccule (Figs. 1, 3, 4). The presence of short hyphae on the surface of immature spores and the lack of the evanescent outermost wall 1 in crushed spores with a separated mantle suggest this mantle to be formed by hyphae developing from wall 1. Wall 1 is visible in most intact spores (Fig. 1). Wall 2 is always present and sometimes detaches from wall 3 in uncrushed spores mounted in lactic acid. Wall 3 consists of two to three laminae usually separating from each other in vigorously crushed spores. Wall 4 is a typical membranous wall. The coriaceous wall 5 is flexible and does not crack, although it is much thicker than the membranous wall 4.

Entrophospora baltica differs greatly from the four described species of the genus *Entrophospora* in appearance, morphology of the spore ornamentation, and in spore wall structure. None of the species of *Entrophospora* forms spores enveloped in a hyphal mantle. *Entrophospora infrequens* (Hall) Ames & Schneider and *E. kentinensis* Wu & Liu produce ornamented spores (Ames and Schneider, 1979; Wu *et al.*, 1995). However, the ornamentation of the former species consists of vacuolated projections developing from a laminated wall. The latter fungus produces spores with pits, also positioned in a laminated wall. In contrast, spores of *E. baltica* are ornamented with warts present on a unit wall adherent to a laminated wall (Figs. 2, 3–5). Spores of *E. baltica* and *E. infrequens* have an innermost coriaceous wall in group B, but those of the latter lack the penultimate membranous wall of the former. The only other arbuscular fungal species with spores having a membranous wall adherent to a coriaceous innermost wall is *Acaulospora gerdemannii* N. C. Schenck & T. H. Nicolson (Morton *et al.*, 1997). The other species of *Entrophospora*, *i.e.*, *E. colombiana* Spain & Schenck and *E. schenckii* Sieverding & Toro, may be separated readily from *E. baltica* by their smooth–walled spores and different wall structure. Additionally, spores of *E. schenckii* are hyaline (Morton and Benny, 1990; Sieverding and Toro, 1987; Schenck *et al.*, 1984).

Other arbuscular fungi having spores enveloped in a sinuate hyphal mantle include *Glomus globiferum* Koske & Walker, *G. mortonii* Bentivenga & Hetrick, *G. sinuosa* (Gerd. & Bakshi)

Almeida & Schenck, and *G. tortuosum* Schenck & Smith (Almeida and Schenck, 1990; Bentivenga and Hetrick, 1991; Koske and Walker, 1986; Schenck and Smith, 1982). However, the mantle of *G. globiferum* spores is composed of interwoven thin–walled hyphae bearing vesiculate swellings, structures not occurring in *E. baltica*. The mantle of *G. mortonii* and *G. sinuosa* consists of thick–walled hyphae, not reacting in Melzer's reagent. The mantle hyphae of *E. baltica* are thin–walled and stain lake red in this reagent. Although the mantle of *G. tortuosum* is composed of thin–walled hyphae, this fungus produces spores with only two walls: a laminated outer wall and a coriaceous inner wall (Morton and Benny, 1990). Spores of *Glomus* spp. originate terminally from subtending hyphae (Morton and Benny, 1990). Additionally, *G. mortonii* and *G. sinuosa* produce spores in sporocarps. In contrast, *E. baltica* spores develop within the neck of a sporiferous saccule and occur singly in the soil.

The small *Glomus*–like vesicles associated with mantle of *E. baltica* (Fig. 6) suggest that this fungus forms a synanamorph as does *A. gerdemannii* (Morton *et al.*, 1997). However, it is unclear whether they are only a young stage of this species or *E. baltica* is dimorphic. Ontogenetic studies with one–species cultures are needed to resolve the question. Unfortunately, this new fungus does not persist even in trap cultures, a similar behavior found for *E. infrequens* (Błaszkowski, pers. observ.).

Glomus fuegianum (Spegazzini) Trappe & Gerd.

Figs. 7–12

Spores occurring in the soil in groups (Figs. 7, 9) or sporocarps comprised of 2 to 28 spore–groups. A single spore–group mostly spherical, 100–140 µm diam, sometimes ovoid, 80–90 x 110–125 µm, consisting of 3 to 17 radially arranged and tightly adherent spores (Fig. 7) developed from a thick–walled, inflated hypha (Fig. 9). Sporocarps pale yellow (3A4) to brown (6E8), ovoid, 390–650 x 420–720 µm to prolate, 190–270 x 290–380 µm, with or without a peridium. Peridium hyaline to golden yellow (5B7), 10–70 µm thick, composed of thin–walled, interwoven hyphae, usually present only on a part of a sporocarp.

Spores (Figs. 9, 10) pale yellow (3A4) to yellowish brown (5B7), globose to subglobose; (20.0–)47.0(–60.0) µm diam or ovoid to prolate; 30–35 x 40–65 µm; with a single subtending hypha; spores frequently surrounded by branched and convoluted hyphae (Figs. 7, 8).

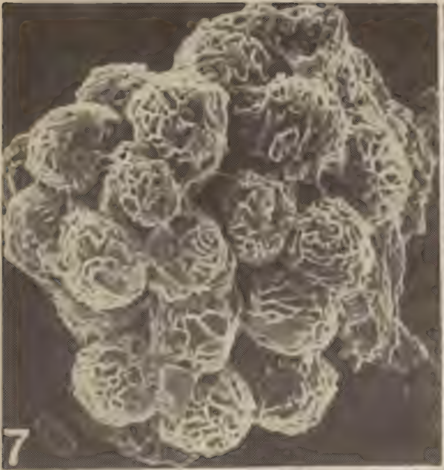
Subcellular structure of spores composed of one wall (Figs. 9–11) consisting of two layers (layers 1 and 2). Layer 1, forming the spore surface, sloughing, smooth, hyaline, (0.5–)0.8(–1.0) µm thick before disintegration, closely attached to layer 2 (Figs. 9, 11). Layer 2 laminated, pale yellow (3A4) to yellowish brown (5B7), (2.7–)3.9(–4.9) µm thick.

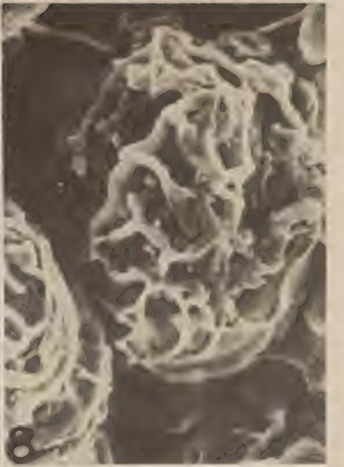
Subtending hypha pale yellow (3A4) to yellowish brown (5B7), straight to recurvate; funnel–shaped, sometimes cylindrical or constricted; (6.1–)7.9(–9.3)µm wide at the spore base. Wall of subtending hypha pale yellow (3A4) to yellowish brown (5B7), (2.2–)2.7(–3.4) µm thick, continuous with spore wall layers 1 and 2.

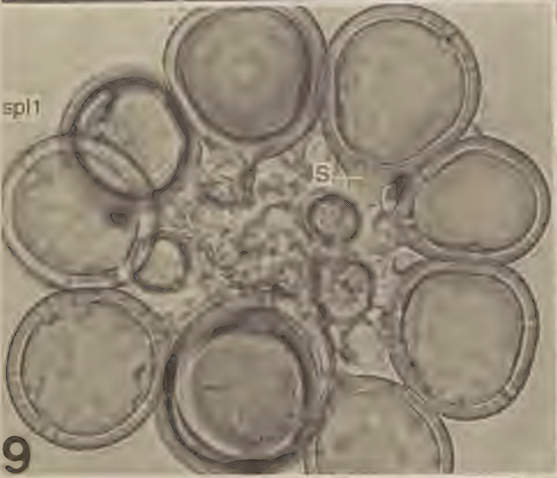
Pore (0.5–)0.9(–1.2) µm wide, occluded by a septum (Figs. 9, 12), *ca* 0.5–1.0 µm wide, continuous with the innermost lamina of wall layer 2, and occasionally by thickening of spore wall layer 2. Spore contents of oil droplets.

COLLECTION EXAMINED. Poland. Kampinos National Park (52°18’N, 20°46’E), all from among the roots of *Juniperus*

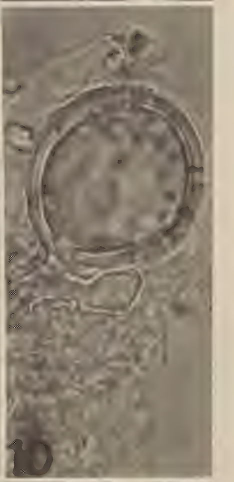
Figs. 7–12. *Glomus fuegianum*. **7.** Spore group (SEM), x296. **8.** Sinuous hyphal mantle (SEM), x1132. **9.** Spore group without hyphal mantle. Spore wall layer 1 (spl1) and a septum (s) enclosing the pore of subtending hypha are seen (BFM), x497. **10.** Young spore developing from the subtending hypha of a mature spore (BFM), x528. **11.** Spore wall layers 1 and 2 (spl1 and spl2) are visible. Phase contrast microscopy, x1497.**12.** Curved septum (S) continuous with the innermost lamina of spore wall layer 2 (BFM), x1872.

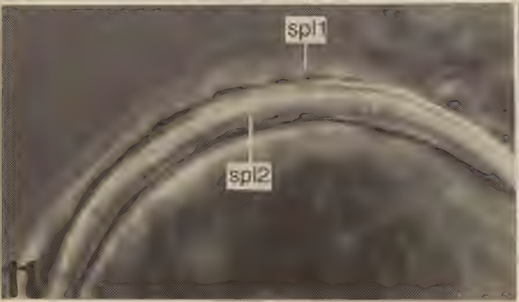

7


8

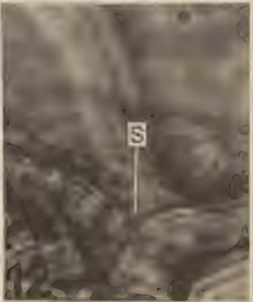


9


10



11



12

communis L., 26 July 191986, and 9 Aug. 1990, *Błaszkowski, J., 2171–2173* (DPP); *Błaszkowski, J., unnumbered collections* (DPP).

OTHER MATERIALS EXAMINED. United Kingdom. Yorks, Chew Valley, near Greenfield, on debris of *Nardus stricta* L., 5 Aug. 1962, *Palmer, J. I. 1835, 2031* (K); Debrys, Middle Moore, near Hayfield, on dead culms of *N. stricta* and *Sphagnum*, 26 Nov. 1961, *Palmer, J. I. 1790, 1808* (K); Middle Moore near Hayfield, on culms of *N. stricta* and on debris of *Polytrichum*, 17 Sept. 1961, *Palmer, J. I. 1592, 1766* (K); Chunal Moor, near Hayfield, on wet culms of *N. stricta* adjacent to *Sphagnetum*, 1 Oct. 1961, *Palmer, J. L. 1778, 1779* (K)

DISTRIBUTION AND HABITAT. In Poland *G. fuegianum* was found only in three soil samples collected from the root zone of *J. communis* growing in the inland dunes of the Kampinos National Park (Tab. 1). Examination of over 1000 other soil samples representing over 150 other sites with both cultivated and uncultivated plants did not reveal this fungus (Błaszkowski, 1993a, b; Błaszkowski, unpubl.).

The spore abundance of *G. fuegianum* in the three soil samples ranged from 14 to 1500 in 100 g dry soil. The proportions of spores of this species in spore populations of all arbuscular fungi recovered ranged from 7.44% to 47.2%. The species richness in these three soils harboring *G. fuegianum* ranged from 2 to 7 in 100 g dry soil. The fungal species occurring together with *G. fuegianum* were *Acaulospora lacunosa* Morton, *A. paulinae* Błaszk., an unknown *Acaulospora* sp., *G. constrictum, G. deserticola* Trappe, Bloss & Menge, *G. dominikii* Błaszk., *G. fasciculatum*, *G. ? geosporum* (Nicol. & Gerd.) Walker, *G. ? heterosporum* Smith & Schenck, *Scutellospora dipurpuresens* Morton & Koske, *S. pellucida* (Nicol. & Schenck) Walker & Sanders, and an unrecognized *Scutellospora* sp.

The chemical properties of a soil of a site closely neighboring that from which *G. fuegianum* was recovered were: pH 5.1; NO_3, 10; P, 14; and K, 9 mg L^{-1} (Błaszkowski, 1997b).

Table 1. Abundace[a] and proportional abundance[b] of *Glomus fuegianum* spores in spore populations of arbuscular fungi isolated, arbuscular taxa associated with this species

Host plant	Date of collection	Abundance	Proportional abundance (%)	Arbuscular taxa associated
Juniperus communis	26.07.1986	14	7.44	*Acaulospora lacunosa, A. paulinae, Glomus deserticola, G. dominikii, G. fasciculatum, G. ? geosporum,* unrecognized *Scutellospora sp.*
Juniperus communis	9.08.1990	308	75.3	*A. lacunosa, G. constrictum, G. dominikii, G. ? heterosporum, S. dipurpurescens, S. pellucida*
Juniperus communis	9.08.1990	1500	47.2	Unrecognized *Acaulospora sp., G. ? heterosporum*

[a] No. of spores in 100 g dry soil.

[b] (no. of spores of a species/total Glomales spores) x 100.

MYCORRHIZAL ASSOCIATION. *Glomus fuegianum* was associated in the field with vesicular–arbuscular mycorrhizae of *J. communis*. This fungus formed spore–groups in trap cultures with *S. vulgare*. Attempts to obtain single–species cultures of this fungus failed.

The unique feature of *G. fuegianum* is the arrangement of its spores in groups (Figs. 7, 9). The spore–groups occur singly in the soil or are aggregated in small or large sporocarps interwoven with branched or convoluted hyphae. The spore–groups originate from swelling hyphae developing radially from thick–walled inflated hyphae. A single spore–group may include up to 17 tightly adherent spores. Due to the crowding, some of the spores may be ellipsoid to clavate. Spore–groups occurring singly in the soil usually lack a peridium which, however, almost always is present when spore–groups are aggregated in sporocarps. The peridium may be thick and, thereby, makes the spores difficult to see. In most of the sporocarps investigated, the peridium only partially encloses the spore–groups, possibly due to its damage by soil microorganisms.

Spores occurring in groups aggregated in sporocarps frequently are surrounded individually by thick–walled, branched, and convoluted hyphae (Figs. 7, 8) arising from the spore–producing region. This hyphal mantle rarely occurs in single spore–groups.

The spore wall of *G. fuegianum* consists of two layers, a hyaline, thin, sloughing outer layer and a colored, thick, laminated inner layer (Figs. 9, 11). The two layers are continuous with the wall layers of a subtending hypha. However, the outer layer frequently was absent in the specimens investigated, especially in those lacking a peridium (Fig. 9). This probably results from a degradative activity of parasitic soil microflora, as Morton (1995) suggested. Using electron microscopy, Yao *et al.* (1992) found in *G. fuegianum* a 3–layered spore wall: an outer electron grey to dense layer, a central electron grey laminated layer, and an inner electron dense layer abutting the lumen. Recent examinations (Błaszkowski, unpubl. observ.) of specimens coming from both

Poland and the United Kingdom suggests that the innermost layer seen by Yao *et al.* (1992) represents one of the inner sublayers of the laminated layer synthesized during spore ontogenesis. Similarly as in other *Glomus* spp. [e. g., *G. melanosporum* Gerd. & Trappe and *G. pustulatum* (Gerdemann and Trappe, 1974; Koske *et al.*, 1986)], the inner laminae of the laminated layer are lighter colored, and hence may appear an additional layer.

The distinctive property of *G. fuegianum* spores also is their wide and short subtending hypha. Because of this, the spores are almost sessile (Fig. 9). The pore of the subtending hypha of the specimens found in Poland is either open or occluded by a curved septum continuous with the innermost lamina of the laminated layer 2 of the spore wall (Figs. 9, 12). According to Yao *et al.* (1992), "the lumen of the spore is occluded by a plug near the junction with the pedicel. This plug lacks the true cross wall nature of a septum and appears to be derived from modified cytoplasm". However, examination of *G. fuegianum* spores from collections deposited in the herbarium of the Royal Botanic Gardens at Kew revealed spores with a subtending hypha occluded by a septum similar to that occurring in spores of this fungus collected in Poland. In *G. caledonium* (Nicol. & Gerd.) Trappe & Gerd., the subtending hypha of immature spores is open, but it becomes occluded by the innermost lamina near completion of the laminated layer differentiation (Morton, 1996). This suggests that Yao's *et al.* (1992) description was made based on immature spores.

The most closely related arbuscular mycorrhizal fungi producing spores similar in appearance and aggregated in structures resembling the spore groups of *G. fuegianum* are *G. rubiforme* (Gerd. & Trappe) Almeida & Schenck and *G. sinuosum* (Gerd. & Bakshi) Almeida & Schenck (Almeida and Schenck, 1990; Wu, 1993 a, b). Although both *G. fuegianum* and *G. rubiforme* form spores from a thick–walled, inflated hypha, the latter species lacks the hyphal mantle. *Glomus sinuosum* spores are mantled by sinuous hyphae reminiscent of those present in *G. fuegianum,* but the spores of *G. sinuosum* originate from a mass of interwoven hyphae, not from an inflated hypha as *G. fuegianum.*

Glomus fuegianum probably is a widely distributed but rarely occurring fungus in the world. This fungus has originally been found in Argentina (Pegler *et al*., 1993). However, most records of *G. fuegianum* come from the United Kingdom (Godfrey, 1957; Pegler *et al*., 1993) where it was considered to be rather widespread. Additionally, *G. fuegianum* has been found in New Zealand (Hall, 1977). The finding of this fungus in only three of over 1000 soil samples collected in different regions of Poland indicates *G. fuegianum* to be an extremely rarely occurring soil fungus in this country.

The ability of *G. fuegianum* to form mycorrhizae has not been experimentally confirmed so far. The type specimen of *G. fuegianum* was found under moss (Pegler *et al*., 1993). Although Godfrey (1957) found this fungus under *Taxus baccata* L., the other reports from the United Kingdom describe the occurrence of *G. fuegianum* associated with above-ground plant parts, including living or dead culms of *Eriophorum angustifolium* Honck., *Molinia coerulea* (L.) Moench, *N. stricta*, *Polytrichum* and *Sphagnum*, as well as with rootstock of *Juncus effusus* L. and wet debris of a *Molinia sp.* Hall (1977) reported this fungus from a forest soil. In Poland *G. fuegianum* was found in the field among vesicular–arbuscular mycorrhizal roots of *J. communis*. Although *G. fuegianum* formed new spore–groups in trap cultures with *S. vulgare*, it failed to sporulate in one–species pot cultures with this plant. The inability of arbuscular mycorrhizal fungi living in trap cultures to sporulate in single–species pot cultures probably results from the especially high selective nature of the latter ones, as Koske *et al.* (1997) and Koske (pers. comm.) suggested. The factor most limiting establishment of mycorrhizae in single–species pot cultures seems to be the lack of microflora of the soil from which a given fungus originated. Soil microorganisms have been demonstrated to hasten mycorrhizal fungus spore germination (Azcon–Aguilar *et al*., 1986) and root colonization (Azcon–Aguilar and Barea, 1985).

According to Morton and Benny (1990), fungi of the order Glomales form obligately arbuscular mycorrhizae in mutualistic associations with living plants. However, the marked saprophytic capability of *G. fuegianum* expressed by the formation of its spores on above–ground plant parts indicate that the fungus is a facultative symbiont. A similar conclusion may be drawn in respect to *G. fasciculatum* and *G. sinuosum* (Gerd. & Bakshi) Almeida & Schenck found to be associated with non–root habitats (Gerdemann and Trappe, 1974; Koske, pers. comm.).

Acknowledgment

We would like to thank Professor R. E. Koske, Department of Biological Sciences, Rhode Island University, U. S. A., and Dr. T. W. K. Young, Division of Life Sciences, King's College, University of London, U. K., for valuable comments on the manuscript. We also thank the curator of the herbarium of the Royal Botanic Gardens at Kew, U. K., for providing specimens of *Glomus fuegianum* for comparison. This study was supported in part by The Committee of Scientific Researches, a grant no. 6.P04C.015.13.

Literature cited

Almeida, R. T., and N. C. Schenck. 1990. A revision of the genus *Sclerocystis* (Glomaceae, Glomales). *Mycologia* 82: 703–714.

Ames R. N., and R. W. Schneider. 1979. *Entrophospora*, a new genus in the Endogonaceae. *Mycotaxon* 8: 347–352.

Azcon–Aguilar, C., and J. M. Barea. 1985. Effect of soil microorganisms on formation of vesicular–arbuscular mycorrhizas. *Trans. Brit. Mycol. Soc.* 84: 536–537.

Azcon–Aguilar, C., R. M. Diaz–Rodriguez, and J. M. Barea. 1986. Effect of soil microorganisms on spore germination and growth of the vesicular–arbuscular mycorrhizal fungus *Glomus mosseae. Trans. Brit. Mycol. Soc.* 86: 337–340.

Bentivenga, S. P., B. A. D. Hetrick. 1991. *Glomus mortonii sp. nov.*, a previously undescribed species in the Glomaceae isolated from the tallgrass prairie in Kansas. *Mycotaxon* 42: 9–15.

Błaszkowski, J. 1993a. Comparative studies of the occurrence of arbuscular fungi and mycorrhizae (Glomales) in cultivated and uncultivated soils of Poland. *Acta Mycol.* 28: 93–140.

Błaszkowski, J. 1993b. The occurrence of arbuscular fungi and mycorrhizae in plant communities of maritime dunes and shores of Poland. *Bull. Polish Acad. Sci.: Biol. Sci.* 41: 377–392.

Błaszkowski, J. 1995. *Glomus corymbiforme*, a new species in Glomales from Poland. *Mycologia* 87: 732–737.

Błaszkowski, J. 1997a. *Glomus gibbosum*, a new species from Poland. *Mycologia* 89: 341–347.

Błaszkowski, J. 1997b. Notes on *Acaulospora bireticulata* (Glomales, Zygomycetes) found in Poland. *Mycotaxon* 61: 193–204.

Błaszkowski, J., and M. Tadych. 1997. *Glomus multiforum* and *G. verruculosum*, two new species in Glomales (Zygomycetes) from Poland. *Mycologia* 89: 804–811.

Franke, M., and J. B. Morton. 1994. Ontogenetic comparisons of arbuscular mycorrhizal fungi *Scutellospora heterogama* and *Scutellospora pellucida*: revision of taxonomic character concepts, species descriptions, and phylogenetic hypotheses. *Canad. J. Bot.* 72: 122–134.

Gerdemann, J. W., and T. H. Nicolson. 1963. Spores of mycorrhizal *Endogone* species extracted from soil by wet sieving and decanting. *Trans. Brit. Mycol. Soc.* 46: 235–244.

Gerdemann J. W., and J. M. Trappe. 1974. The Endogonaceae in the Pacific Northwest. *Myc. Memoir* 5: 1–76.

Godfrey R. M. 1957. Studies of British species of *Endogone.* I. Morphology and taxonomy. *Trans. Brit. Mycol. Soc.* 40: 117–135.

Hall, I. R. 1977. Species and mycorrhizal infections of New Zealand Endogonaceae. *Trans. Brit. Mycol. Soc.* 68: 341–356.

Kornerup, A., and J. H. Wanscher. 1983. *Methuen handbook of colour.* 3rd Ed. E. Methuen and Co., Ltd., London. 252 pp.

Koske, R. E., and C. Walker. 1986. *Glomus globiferum*: a new species of Endogonaceae with a hyphal peridium. *Mycotaxon* 26: 133–142.

Koske, R. E., and B. Tessier. 1983. A convenient, permanent slide mounting medium. *Newsl. Mycol. Soc. Am.* 34: 59.

Koske, R. E., C. Friese, C. Walker, and Y. Dalpé. 1986. *Glomus pustulatum*: a new species in the Endogonaceae. *Mycotaxon* 26: 143–149.

Koske, R. E., J. N. Gemma, and N. Jackson. 1997. Mycorrhizal fungi associated with three species of turfgrass. *Can. J. Bot.* 75: 320–332.

Morton, J. B. 1995. Taxonomic and phylogenetic divergence among five *Scutellospora* species based on comparative developmental sequences. *Mycologia* 87: 127–137.

Morton, J. M. 1996. Redescription of *Glomus caledonium* based on correspondence of spore morphological characters in type specimens and a living reference culture. *Mycorrhiza* 6: 161–166.

Morton, J. B., and G. E. Benny. 1990. Revised classification of arbuscular mycorrhizal fungi (Zygomycetes): a new order, Glomales, two new suborders, Glomineae and Gigasporineae, and two new families, Acaulosporaceae and Gigasporaceae, with an emendation of Glomaceae. *Mycotaxon* 37: 471–491.

Morton, J. B., J. D. Bever, and F. L. Pfleger. 1997. Taxonomy of *Acaulospora gerdemannii* and *Glomus leptotichum*, synanamorphs of an arbuscular mycorrhizal fungus in Glomales. *Mycol. Res.* 101: 625–631.

Pegler, D. N., B. M. Spooner, and T. W. K. Young. 1993. *British truffles. A revision of British hypogeous fungi.* Royal Botanic Gardens, Kew. 216 pp. + 26 plates.

Phillips, J. M., and D. S. Hayman. 1970. Improved procedures for clearing roots and staining parasitic and vesicular–arbuscular mycorrhizal fungi for rapid assessment of infection. *Trans. Brit. Mycol. Soc.* 55: 158–161.

Schenck, N. C., and G. S. Smith. 1982. Additional new and unreported species of mycorrhizal fungi (Endogonaceae) from Florida. *Mycologia* 74: 77–92.

Schenck, N. C., J. L. Spain, and R. H. Howeler. 1984. Several new and unreported vesicular–arbuscular mycorrhizal fungi (Endogonaceae) from Colombia. *Mycologia* 76: 685–699.

Sieverding E., and T. Toro. 1987. *Entrophospora schenckii*: a new species in the Endogonaceae from Colombia. *Mycotaxon* 28: 209–214.

Spain, J. L., E. Sieverding, and N. C. Schenck. 1989. *Gigaspora ramisporophora*: a new species with novel sporophores from Brazil. *Mycotaxon* 34: 667–677.

Stürmer, S. L., and J. B. Morton. 1997. Developmental patterns defining morphological characters in spores of four species in *Glomus*. *Mycologia* 89: 72––81.

Walker, C. 1983. Taxonomic concepts in the Endogonaceae: Spore wall characteristics in species descriptions. *Mycotaxon* 18: 443–455.

Walker, C. 1986. Taxonomic concepts in the Endogonaceae. II. A fifth morphological wall type in endogonaceous spores. *Mycotaxon* 25: 95–99.

Walker, C., and J. M. Trappe. 1993. Names and epithets in the Glomales and Endogonales. *Mycol. Res.* 97: 339–344.

Wu, C. G. 1993a. Glomales of Taiwan: III. A comparative study of spore ontogeny in *Sclerocystis* (Glomaceae, Glomales). *Mycotaxon* 47: 25–39.

Wu, C.–G. 1993b. Glomales of Taiwan: IV. A monograph of *Sclerocystis* (Glomaceae). *Mycotaxon* 49: 327–349.

Wu, C.–G., Y.–S. Liu, Y.–L. Hwuang, Y.–P. Wang, and C.–C. Chao. 1995. Glomales of Taiwan: V. *Glomus chimonobambusae* and *Entrophospora kentinensis*, spp. nov. *Mycotaxon* 53: 283–294.

Yao Y.–J., D. N. Pegler, and T. W. K. Young. 1992. Ultrastructure of *Glomus fuegianum*. *The Mycologist* 6: 132–137.

MYCOTAXON

Volume LXVIII, pp. 185-192 July-September 1998

NEW RECORDS FROM INDIA AND REDESCRIPTON OF *CORYNASCUS THERMOPHILUS* AND ITS ANAMORPH *MYCELIOPHTHORA FERGUSII*

Lynne Sigler
Univerity of Alberta Microfungus Collection and Herbarium
Devonian Botanic Garden, Edmonton, Alberta, Canada T6G 2E1

K.R. Aneja and R. Kumar
Department of Botany, Kurukshetra University, Haryana, 136 119 India

R. Maheshwari
Department of Biochemistry, Indian Institute of Science, Bangalore, 560 012 India

R.V. Shukla
Department of Botany, C.M.D. College, Bilaspur, M.P. 495 001 India

ABSTRACT

Studies of Indian thermophilic fungi have yielded several isolations of *Myceliophthora fergusii*, anamorph of the heterothallic ascomycete *Corynascus thermophilus* (Thielaviaceae). Identification was confirmed by matings. *Chrysosporium fermentotritici* is a synonym of *M. fergusii*.

Studies of soil and decomposing jute in India recovered isolates of a rapid growing thermophilic conidial fungus initially thought to be a new species of *Chrysosporium* or *Sporotrichum*. The isolates were shown to be *Corynascus thermophilus* (Fergus & Sinden) Klopotek by mating studies. However because their identification had proven elusive to the authors and to several other investigators, we consider it appropriate to briefly redescribe the species, to review the taxonomic history, and to report the new records. The key features which distinguish the anamorph *Myceliophthora fergusii* (Klopotek) Oorschot from *M. thermophila* (Apinis) Oorschot are noted.

Taxonomy

Corynascus thermophilus (Fergus & Sinden) Klopotek, Arch. Microbiol. 98:366, 1974
FIGS. 1-3

≡*Thielavia thermophila* Fergus & Sinden, Can. J. Bot. 47:1635
Anamorph: *Myceliophthora fergusii* Klopotek, Arch. Microbiol. 98:366
≡*Chrysosporium fermentotritici* K. Matsush. & T. Matsush. 1996, Fragmenti Mycologica II p. 32

Heterothallic. Ascomata globose, non-ostiolate, 100-250 µm diam., dark brown to black, smooth, without setae, hyphal wall tissue forming a peridium of textura angularis, submerged in the agar or exposed and then aggregating in clusters. **Asci** few or many per ascoma, thin-walled and evanescent at an early stage, stalked and broadly clavate, commonly containing 4 to 6 ascospores which mature at different rates, sometimes with fewer ascospores. **Ascospores** non-septate, broadly ellipsoidal, initially hyaline, dark brown when mature, smooth, with terminal germ pores, de Bary bubble common when mounted in lactofuchsin, (16)20-28 x (11)12-20 µm.

Hyphae 2-8 µm, hyaline, septate, individual cells sometimes swelling up to 12 µm in diam., fertile regions branched, commonly 2-4 µm diam. **Conidiogenous cells** integrated and undifferentiated, polyblastic, bearing conidia sessile and serially, or ampulliform lateral stalks or terminal cells measuring 8-22 x 4-11 µm and bearing one to several conidia. Frequently the ampulliform stalk and conidia detach as a unit and may undergo swelling. **Conidia** are smooth, thin-walled, nonseptate, obovoid, pyriform, rarely cylindrical, hyaline, becoming tan in age and in mass, 4-15 x 3.5-9 µm, commonly 6-11 x 4-8 µm, released by lytic dehiscence; detached conidia may swell and become globose or subglobose.

Colonies on potato dextrose agar (Difco) reach diameters of 65-70 mm in 48 hours, and the edge of the petri dish within 72 hours at 40 C. At 48 hours, colonies are densely floccose, raised to the lid, yellowish tan with a broad white irregular margin 5-6 mm wide. At 7 days, colonies become mealy or densely powdery with tufts of flocculent hyphae that may adhere to the lid. The color is greyish orange (6B/E3) (Kornerup & Wanscher, 1978) on the obverse and greyish brown on the reverse. Some isolates produce a pink-red diffusing pigment (12A4/E6). Growth rate is similar on 2% MEA at 40 C but colonies after 6 days develop only sparse tufts of aerial mycelium. Radial growth rates are 0.05 mm h^{-1} at 30 C, 1.2 mm h^{-1} at 40 C and 1.9 mm h^{-1} at 45 C.

Results of mating tests performed on home-made cornmeal agar (Kane et al. 1997) either without or with a cellophane membrane layered on the surface (Carmichael 1962) are shown in Table 1. Good fertility was demonstrated in pairings among wild type isolates and with the ex-type mating strains, but the ex-types produced only small infertile ascomata when paired together.

Table 1. Results of mating tests among strains of *Corynascus thermophilus* on cornmeal agar at 40 C

	Plus mating strains				
Minus mating strains	ATCC 22066 (=UAMH 9030) ex-type mating strain	UAMH 2982	UAMH 6111	UAMH 8054	UAMH 9160
ATCC 22067 (=UAMH 9031) ex-type mating strain	infertile ascomata	+	+	+	+
UAMH 2984	–	NT	NT	+	NT
UAMH 5791	+	NT	+	+	+

NT- not tested.

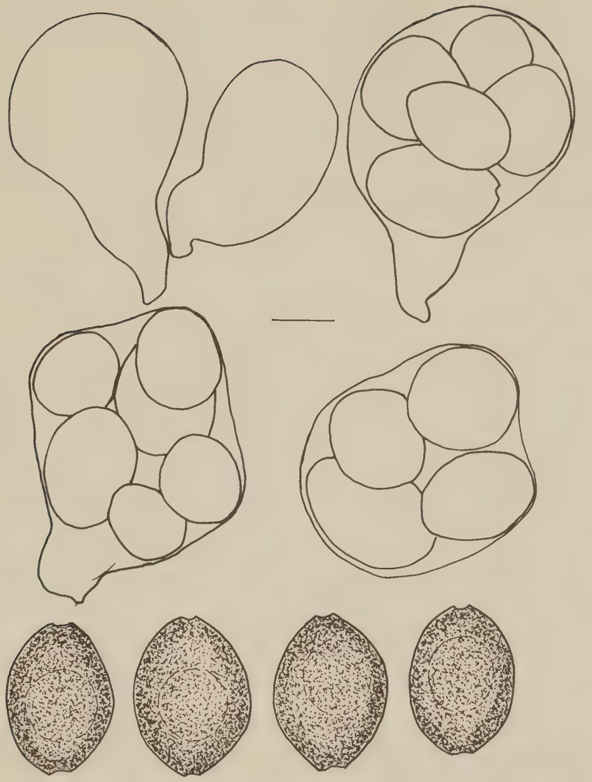


Figure 1. Asci containing 4 to 6 ascospores and mature ascospores of *Corynascus thermophilus* (UAMH 5791 x 8054). Bar = 10 µm.

Source of strains: UAMH 2982 (ADD IX) & 2984 (DVD III), coal spoil tips, U.K., H.C. Evans, ?1968; UAMH 5791, decomposing jute fibers, Banda, U.P., India, R.V. Shukla, 1987; UAMH 6111, soil, India, R. Maheshwari (IIS-278), 1988; UAMH 8054, soil, Jim Corbet National Park, Nainital, India, K.R. Aneja, April 1994; ATCC 22066, + ex-type mating strain, from mushroom compost, Pennsylvania, C.L. Fergus (R46W1) [=UAMH 9030, CBS 405.69]; ATCC 22067, – ex-type mating strain, from mushroom compost, PA, C.L. Fergus (R46W2) [=UAMH 9031, CBS 406.69]; UAMH 9160, ex-type *Chrysosporium fermentotritici*, wheat silage, Tierkcoof, near Piketberg, South Africa, T. Matsushima & K. Matsushima, Sept. 1995, MFC-5K411.

Discussion

Fergus and Sinden (1969) described *Thielavia thermophila* for several thermophilic heterothallic isolates from mushroom compost. They referred the anamorph to the genus *Sporotrichum* and considered it to be morphologically distinct

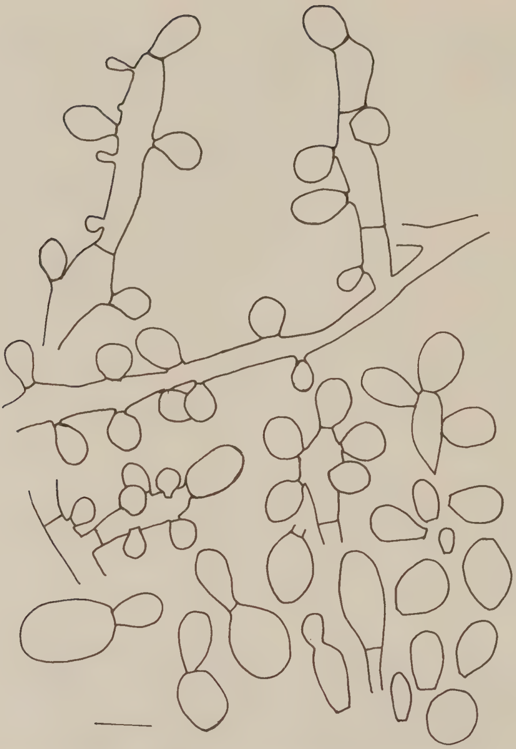


Fig. 2. *Myceliophthora fergusii* conidia and conidiogenous cells (top UAMH 8054, bottom 5791 and 9031). Bar = 10 µm.

from *S. thermophile* Apinis which had been redescribed by Semeniuk and Carmichael (1966). Additionally, the latter species failed to produce a teleomorph. Hedger and Hudson (1970) provided the first detailed comparison of the anamorphs. Klopotek (1974) argued that the anamorphs were inappropriately placed in the genus *Sporotrichum* because of its basidiomycete affinity and redisposed them in the genus *Chrysosporium*. She transferred the teleomorph to *Corynascus* as *C. thermophilus* (Fergus & Sinden) Klopotek and proposed *Chrysosporium fergusii* Klopotek for the anamorph because it had not previously been named. She also transferred *S. thermophile* as *C. thermophilum* (Apinis) Klopotek and later described its teleomorph as *Thielavia heterothallica* Klopotek (Klopotek 1976) [=*Corynascus heterothallicus* (Klopotek) Arx (von Arx 1981)]. Oorschot (1977) transferred both anamorphs to the genus *Myceliophthora* as *M. fergusii* and *M. thermophila*.

Although descriptions of *M. fergusii* exist, the fungus appears to be difficult to recognize as judged by our own difficulties (Shukla 1985) and by the recent description of a new species for it (*C. fermentotritici* Matsushima & Matsushima 1996). The tendencies for the fertile hyphae to lyse at a very early stage and for the detached conidia to swell making them appear dissimilar to published illustrations are factors. An optimum method for study of conidiogenesis is to prepare either a tape mount or slide culture preparation in lactofuchsin using growth from a 48 to 72 hour culture at 37 or 40 C (Kane et al. 1997). The connection between *Chrysosporium fermentotritici* is proven here by matings between the ex-type strain and the ex-type "–" mating strain and one wild type isolate (Table 1). Confirmation by mating can be a reliable character but requires availability of fertile mating-type strains. Although the ex-type strains were compatibile with our wild type isolates, they demonstrated poor fertility when paired with each other. Our observations on the teleomorph agreed with previous descriptions except that we found up to 6 ascospores per ascus rather than 4 or fewer as had been reported (Fergus & Sinden 1969; Hedger & Hudson 1970).

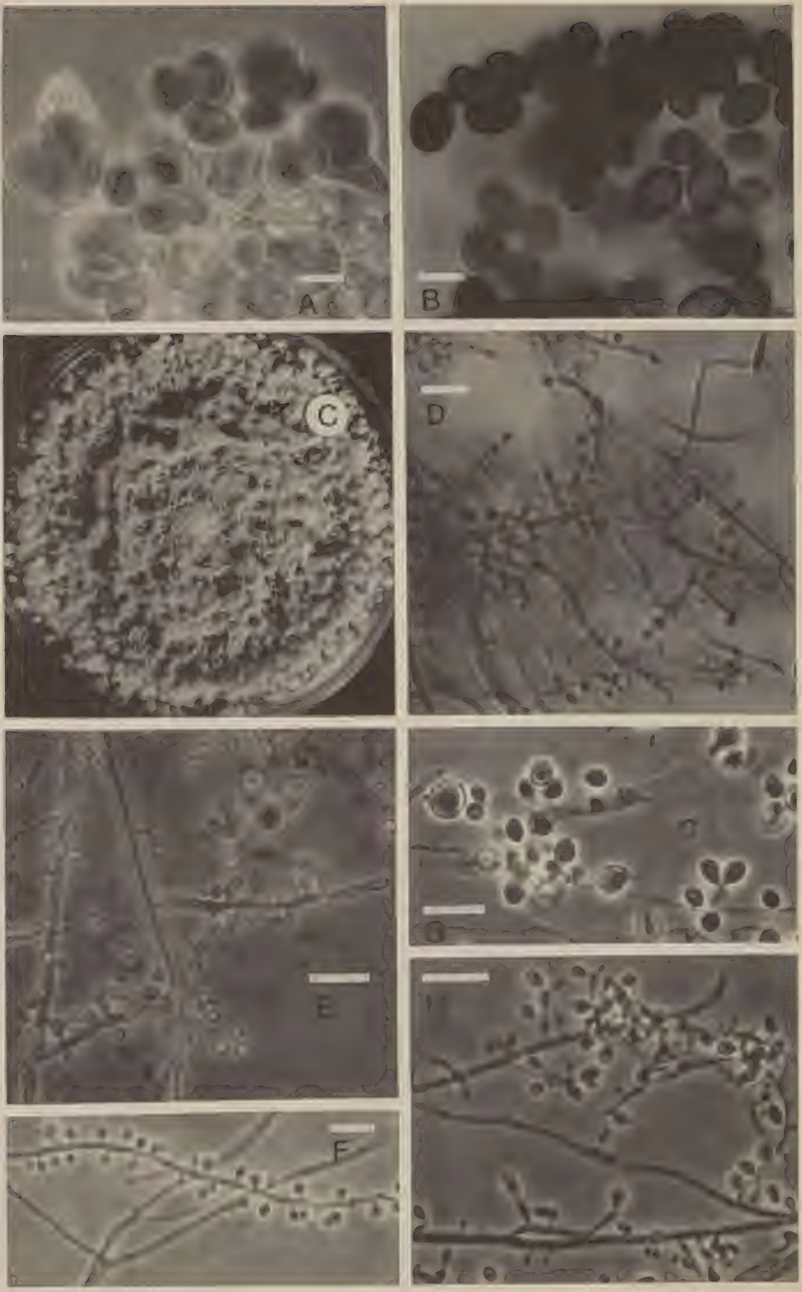
Several features differentiate *M. fergusii* from *M. thermophila* which may be found in similar habitats. The conidia of *M. fergusii* are smooth, larger (commonly 6-11 x 4-8 μm), hyaline to tan, more commonly formed sessile than on swollen stalks. The stalks and conidia sometimes detach as a unit. Other features include raised, densely floccose colonies on PDA which become strongly powdery and leave tufts on the lid of the petri dish, production of a pink-red diffusing pigment in some isolates, and broader hyphae (2 to 8 μm diam.). On 2 to 3% MEA aerial growth is suppressed in *M. fergusii* but more robust and granular in *M. thermophila.* On PDA, colonies of *M. thermophila* are pink to buff, rapidly turning cinnamon brown, densely powdery and only slightly raised. Most isolates produce a cinnamon brown diffusible pigment. Conidia are orange-brown and usually warty but may be smooth, and are smaller, mostly 5-8 x 3-4 μm (Semeniuk & Carmichael 1966; Hedger & Hudson 1970). Conidia may be sessile but are more often borne on ampulliform swellings (Fig. 3H). The teleomorph of *M. thermophila* is *Corynascus heterothallicus* but few isolates have been studied for their propensity to form this stage (Klopotek 1976; Oorschot 1977; Arx et al. 1988). Ascospores are smaller (7.5-11 x 4.5-7μm) and have one germ pore (Klopotek 1976).

Both species are moderately to strongly cellulosic and known from decomposing wheat straw, mushroom compost, wheat or alfalfa silage and soil in temperate climates. The recovery of *M. fergusii* from soil and jute fibers in India and from wheat silage in Japan extends its geographic range beyond Europe and North America. *M. fergusii* has not been reported from human sources as have *M. thermophila* and *M. lutea* Cost. (Sigler 1997; Bourbeau et al. 1992) but the species may go unrecognized.

The anamorphs of several species of *Corynascus* (Arx 1975) are placed in *Myceliophthora* (Oorschot 1977, 1980). This genus is appropriate for disposition of cellulosic sordariaceous anamorphs in which solitary conidia (aleurioconidia) are borne on swollen cells or sessile (Sigler in McGinnis et al. 1992), i.e. *M. lutea* and *M. hinnulea* Awao & Udagawa (teleomorphs unknown), *M. thermophila* (teleomorph *C. heterothallicus*), *M. fergusii* (teleomorph *C. thermophilus*) and the *Myceliophthora* anamorphs of *C. sepedonium* (Emmons) Arx and *C. novoguineensis* (Udagawa & Horie) Arx. Inappropriately placed are several keratinolytic species with teleomorphs

---

Figure 3. A. Asci and ascospores (6111x5791). B. Ascospores (5791 x 8054). C. Colony on PDA after 3 days at 40 C (6111). D-F. *Myceliophthora fergusii* anamorph showing conidia borne sessile and on ampulliform conidiogenous cells (D,F-8054, E-9031). G. Detached conidia, some rounding up (6111). H. Compare *M. thermophila* (6713) with conidia commonly borne on ampulliform stalks. Bar=20 μm.


A
B
C
D
E
F

known or presumed to be in the Arthrodermataceae or Onygenaceae (Sigler in McGinnis et al. 1992; Sigler 1997). These include *Chrysosporium asperatum* J.W. Carm. (=*M. vellerea* fide Oorschot 1980), *C.* anamorph of *Ctenomyces serratus* Eidam, *C.* anamorph of *Arthroderma tuberculatum* Kuehn. In addition to being cellulosic, species of *Myceliophthora* sensu stricto are thermotolerant or thermophilic.

Acknowledgements

Review by Dr. David Malloch, University of Toronto is gratefully acknowledged. The senior author thanks the Natural Sciences and Engineering Research Council of Canada for financial support, Arlene Flis and Linda Abbott of UAMH for technical assistance, and the ATCC and Dr. Matsushima for providing cultures.

Literature Cited

Arx, J.A. von. 1975. On *Thielavia* and some similar genera of ascomycetes. Stud. Mycol. 8:1-29.

Arx, J.A. von. 1981. On *Monilia sitophila* and some families of ascomycetes. Sydowia 34:13-29.

Arx, J.A. von, M.J. Figueras and J. Guarro. 1988. Sordariaceous ascomycetes without ascospore ejaculation. Nova Hedwigia 94:1-104.

Bourbeau, P., D.A. McGough, H. Fraser, N. Shah and M.G. Rinaldi.1992. Fatal disseminated infection caused by *Myceliophthora thermophila*, a new agent of mycosis: case history and laboratory characteristics. J. Clin. Microbiol. 30:3019-3023.

Carmichael, J.W. 1962. *Chrysosporium* and some other aleuriosporic hyphomycetes. Can. J. Bot. 40:1137-1173.

Fergus, C.L. and J.W. Sinden. 1969. A new thermophilic fungus from mushroom compost: *Thielavia thermophila* spec. nov. Can. J. Bot. 47:1635-1637.

Hedger, J.N. and H.J. Hudson. 1970. *Thielavia thermophila* and *Sporotrichum thermophile*. Trans. Br. mycol. Soc. 54:497-500.

Kane, J., R. Summerbell, L. Sigler, S. Krajden and G. Land. 1997. *Laboratory handbook of dermatophytes. A clinical guide and laboratory manual of dermatophytes and other filamentous fungi from skin, hair and nails.* Star Publishing Co., Belmont, CA.

Klopotek, A. von. 1974. Revision der thermophilen *Sporotrichum*-Arten: *Chrysosporium thermophilum* (Apinis) comb. nov. und *Chrysosporium fergusii* spec. nov. = status conidialis von *Corynascus thermophilus* (Fergus und Sinden) comb nov. Arch. Microbiol. 98:365-369.

Klopotek, A. von. 1976. *Thielavia heterothallica* spec. nov. die perfekte form von *Chrysosporium thermophilum*. Arch. Microbiol. 107:223-224.

Kornerup, A. and J.H. Wanscher. 1978. *Methuen Handbook of Color*, 3rd ed. Methuen, London, U.K.

Matsushima, T. and T. Matsushima. 1996. Fragmenti Mycologica - II. pp 31-40. Published by the authors, Matsushima Fungus Collection, Kobe, Japan.

McGinnis, M.R., L. Sigler, B.H. Bowman, M. Masuda and C.J.K. Wang. 1992. Impact of conidiogenesis, teleomorph connections, pleomorphism and molecular genetics on evolving hyphomycete systematics. J. Med. Vet. Mycol. 30 (Suppl. 1):260-269.

Oorschot, C.A.N. van. 1977. The genus *Myceliophthora*. Persoonia 9:401-408.

Oorschot, C.A.N. van. 1980. A revision of *Chrysosporium* and allied genera. Stud. Mycol. 20:1-89.

Semeniuk, G. and J.W. Carmichael. 1966. *Sporotrichum thermophile* in North America. Can. J. Bot. 44:105-108.

Shukla, R.V. 1985. Morphological and biochemical studies of some thermophilic fungi. Ph.D. thesis, Univ. of Saugar, M.P., India.

Sigler, L. 1997. *Chrysosporium* and molds resembling dermatophytes. IN: *Laboratory handbook of dermatophytes. A clinical guide and laboratory manual of dermatophytes and other filamentous fungi from skin, hair and nails.* (Kane, J. et al.). pp 261-311. Star Publishing Co., Belmont, CA.

MYCOTAXON

Volume LXVIII, pp. 193-204 July-September 1998

NOTES ON FOUR LITTLE RED RUSSULAS

RAYMOND M. FATTO
1187 Millstone River Road
Somerville, NJ 08876-4726

ABSTRACT

Two new species of *Russula* section *Rigidae* subsection *Roseinae* are described and their relationship with several other members of the subsection is discussed. Two other little red Russulas, *Russula corallina* and *Russula uncialis*, are redescribed to provide modern illustrated descriptions.

INTRODUCTION

Often many little red-capped Russulas are observed in a deciduous habitat, but few are usually identified to species. To assist in the recognition of some of these collections, modern redescriptions are offered to supplement Hesler's (1960) microscopic data on the perhaps uncommon *Russula uncialis* Peck and the more often encountered *Russula corallina* Burlingham, which I have observed fruiting from Maine to North Carolina. Some other collections with pink to red areas on the stipe have not conformed to any published *Russula* literature, hence two species, *R. pseudopeckii* and *R. rubellipes* are described as new and placed in subsection *Roseinae* of section *Rigidae*.

MATERIALS AND METHODS

Color terms and designations used in the following descriptions are cited from Maerz & Paul (1950), e.g., M&P 4J6, or from the ISCC-NBS system (Kelly & Judd, 1955), e.g., 15 moderate Red. Otherwise, color names are the author's concept of general color hues. Microscopic descriptions were made from sections mounted in 3% KOH and Melzer's reagent. Recorded spore sizes exclude ornamentation. Unless otherwise indicated, the massed spore color designated by a capital letter from A to H refers to the spore color code of Pearson (1950).

TAXONOMY

Russula pseudopeckii Fatto, sp. nov. Figs. 1-5

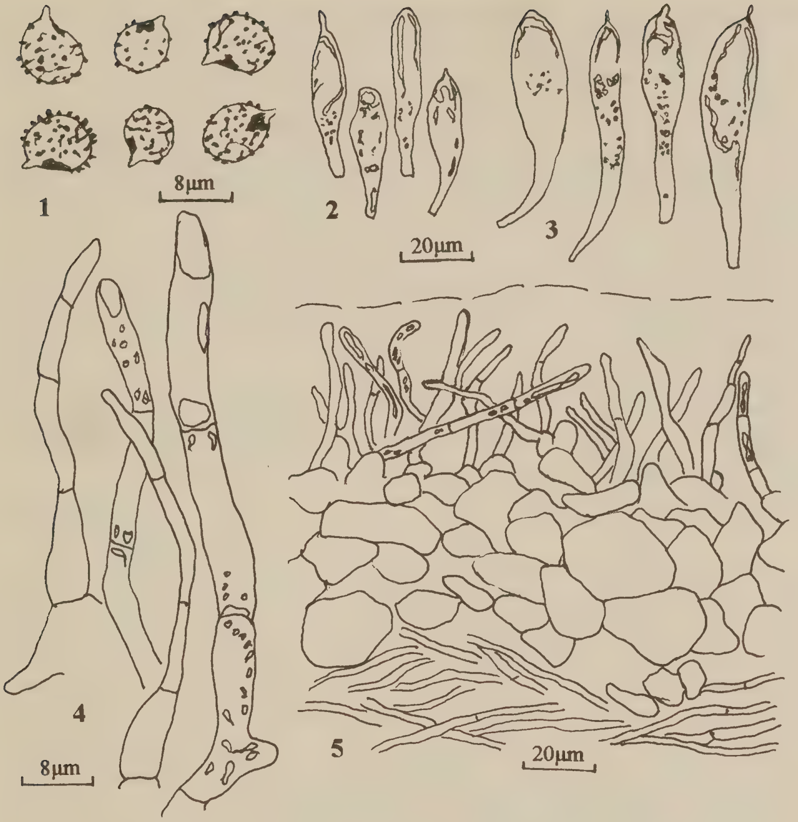
Pileus 2-7 cm latus, hemisphaericus, maturans ad plano-depressum; margo striatulus; cutis separabilis usque ad semi-radium, glabra, vive rubra; trama alba, immutans; sapor mitis; odor indistinctus. Lamellae adnexae, confertae, albidae. Stipes ad 6 x 1.2 cm, glabrus, albus cum areis roseis. Omnes tramae siccae, valde rubrae in sulfovanillino. Sporae accumulatae cremeae (Romagnesi IIc), 6.0-7.6 (-8.0) x 4.8-6.0 (-6.4) µm, flocculae 0.4-0.6 (-0.8) µm altae, segregatae vel cum paucis lineis tenuibus, nullum reticulum. Cystidia hymenialia 34-68 x 8-14 µm, ventricosa ad clavata, vacua vel cum parvis accumulatis reflexis. Pileus-subcutis pseudoparenchymatosa. Pileus-epicutis ixotrichodermis hyalinae, hyphae latae 2-4 µm atque hyphae latae encrustatae originales 3-5 µm.

Holotypus: legit Fatto 550, lectus in Mendham town park, Morris County, New Jersey, USA. 12 August 1990. Conservatus in herbario Horti Botanicalis Novi Eboraci (NY).

Pileus 2-7 cm broad, hemispherical, maturing plano-depressed; margin even, in age becoming slightly tuberculate-striate 2-4 mm inward from the edge; cuticle viscid when wet, dull dry, glabrous, separable normally to one-half the radius, clean bright red, hues in the area of 13 deep Red to 11 vivid Red, M&P 4L6, the disc area only slightly deeper in hue than the margin; trama thin, to 3 mm at mid-radius, brittle, white, unchanging when injured, with a mild taste and a slightly fruity to nondescript odor. **Lamellae** 2-4 mm broad at mid-radius, rounded in front, adnexed to adnate, close to crowded, mostly equal with an occasional basal fork and with a few long lamellulae, edges even, brittle, whitish to pale cream. **Stipe** 2-6 cm long, 5-12 mm thick, equal to slightly enlarged towards the base, dry, dull, glabrous, slightly longitudinally rugulose, white with varying amounts of pale to deep pink but not seen with more than half of surface toned, stuffed, unchanging when bruised.

Chemical reactions (stipe surface and trama): sulfovanillin (SV) strong purplish red; 10% $FeSO_4$ pale salmon-tan; 2% phenol dark grayish brown.

Spores cream in mass, C-D or IIc (Romagnesi, 1967), 6.0-7.6 (-8.0) x 4.8-6.0 (-6.4) µm, average 7.0 x 5.6 µm, broadly elliptic to broadly obovate or subglobose; ornamentation amyloid, of warts 0.4-0.6 (-0.8) µm high which may be isolated or short catenulate or with fine lines connecting 2-6 warts without forming a reticulum; suprahilar area a small irregular amyloid patch; hilar appendix inamyloid, inconspicuous. **Basidia** 28-44 x 8-12 µm, clavate, 4-sterigmate. **Pleurocystidia** 52-68 x 8-14 µm, ventricose to clavate, appendiculate, mucronate, or broadly rounded apically, mostly empty but many containing random small masses or granules which are refractive in KOH and Melzer's and weakly SV+, originating in the subhymenium, projecting up to 30 µm beyond the basidioles, common. **Cheilocystidia** 34-48 x 8-11 µm, smaller but otherwise similar to pleurocystidia. **Subhymenium** 20-40 µm thick, pseudoparenchymatous. **Trama** without laticiferous or clear vascular hyphae. **Pileus subcutis** 70-110 µm thick,



FIGS. 1-5. *Russula pseudopeckii* (Fatto 550, holotype). 1. Spores. 2. Cheilocystidia. 3. Pleurocystidia. 4. Hyphal ends from pileus cuticle. 5. Pileus cuticle (dotted line represents surface of gelatinous matrix). Outlined areas in hyphae and cystidia indicate refractive masses.

pseudoparenchymatous, cells vary in width from 8-32 µm, with the lower portion of horizontal-interwoven smooth hyphae 3-9 µm wide, no vascular or laticiferous hyphae observed. **Pileus epicutis** 30-60 µm thick, without pileocystidia, an ixotrichoderm of hyphae rising from the inflated cells of the subcutis, some of the hyphae are hyaline, septate, sparingly branched with apical cells 2-4 µm wide, lower cells inflated 6-20 µm wide in elongated or inequilateral shapes as they merge into the pseudoparenchymatous subcutis, also primordial hyphae, 40-60(-90) x 3-5 µm, septate, lightly incrusted with particles red in SV but very pronounced when treated with fuchsin, with refractive areas in the end cells which are SV+ as in the hymenial cystidia. **Stipe cuticle** of longitudinal-interwoven, septate, branched, 2-5 µm broad, hyaline hyphae with some projecting tips resembling the epicutal primordial hyphae with weakly SV+ refractive areas in the end cells.

Habitat solitary on soil in mixed deciduous forests; July and August.

MATERIAL EXAMINED: NEW JERSEY: Hunterdon Co.: Oldwick, 15 Jul 1987, Fatto 207. Monmouth Co.: Holmdel Park, 13 Aug 1995, Fatto 891. Morris Co.: Mahlon Dickerson Reservation, 28 Aug 1994, Fatto 832; Mendham town park, 2 Aug 1987, Fatto 234; 12 Aug 1990, Fatto 550 (Holotype, NY); 21 Jul 1991, Fatto 615; 10 Jul 1994, Fatto 795. Warren Co.: Stephens State Park, 10 Aug 1986, Fatto 168; 26 Aug 1990, Fatto 565. (Other than holotype, all in RMF personal herbarium).

OBSERVATIONS: *Russula pseudopeckii* is overall quite similar to *R. peckii* and also belongs in subsection *Roseinae*. It differs in that it fruits in mixed deciduous forests, has lamellae with even margins, and a stipe only tinged with light pink washes often occurring only on one side. In mass the spores are an obvious yellowish cream, C-D, rather than white, A. Microscopically the spores are smaller, with shorter warts; the refractive areas in the hymenial cystidia are shaped and distributed differently; and the pileus epicutis is thinner, with shorter hyphae projecting above the pseudoparenchymatous area.

Russula rubellipes Fatto, sp. nov. Figs. 6-10

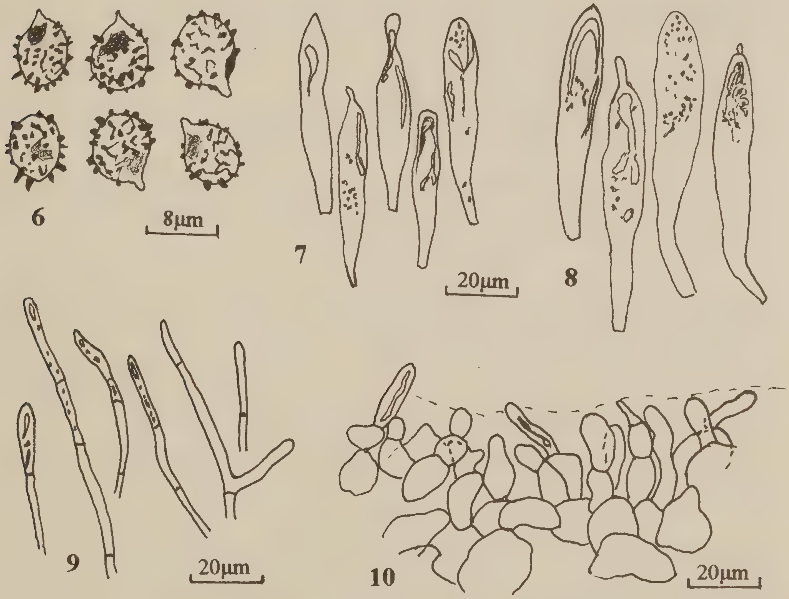
Pileus 2-6 cm latus, convexus, maturans ad plano-concavum; margo striatulus leniter; cutis separabilis usque ad tres-quartas partes radii, glabra, in margine subaureolata, valde rubra; trama alba, immutans; sapor mitis; odor nullus. Lamellae adnexae, confertae, albae. Stipes ad 7 x 1 cm, glabrus, roseus usque ad valde roseum, immutans. Omnes tramae siccae valde rubrae in sulfovanillino. Sporae accumulatae cremeae (Romagnesi IIc), 6.4-8.0 x 5.2-6.4 µm, flocculae 0.6-1.1 µm, segregatae vel cum lineis tenuibus, nullum reticulum. Cystidia hymenialia 36-76 x 6-12 µm, fusiformia usque ad subclavata, vacua vel cum parvis accumulatis reflexis. Pileus-subcutis dispositus ad libram, irregularis, cum hyphis hyalinis. Pileus-epicutis constituta in gelatinosa matrice, "virescens-structura" cellularum pseudoparenchymatosarum cum hyalinis-hyphis cuspidibus solitariis et non ramosis atque cum hyphis encrustatis originalibus 20-45 x 2.5-5.5 µm.

Holotypus: legit Fatto 951, lectus in Hutcheson Memorial Forest, Universitatis Rutgers, apud vetustas silvas quercus et caryae, Somerset County, New Jersey, USA. 10 July 1996. Conservatus in herbario Horti Botanicalis Novi Eboraci (NY).

Pileus 2-6 cm broad, convex, aging to plano-concave; margin even, in age weakly striate to 5 mm from the edge inward; cuticle viscid when wet, soon dry, dull, glabrous, in age marginal area minutely subareolate to subfarinose, separable 1/2 to 3/4 the radius, disc area 17 very dark Red, M&P 55L9 to 44 dark reddish Brown, M&P 56L9, paling marginally to 13 deep Red, M&P 4L6 or 16 dark Red, M&P 6K6; trama thin, to 2 mm at mid-radius, brittle, yellowish white, unchanging when cut, taste mild, odor nil. **Lamellae** 4-8 mm broad at mid-radius, rounded in front, adnexed to adnate, close, equal but with an occasional long lamellula or a fork fairly close to the stipe, edges smooth to slightly fimbriate, moderately brittle, creamy white, non staining when injured. **Stipe** 3-7 cm long, 4-10 mm wide, enlarging slightly towards the base, glabrous, longitudinally rugulose, always with pink areas, often completely 4 light Pink, M&P 1D1 with one side darkened to 2 strong Pink, M&P 2G3 or approaching 6 dark Pink, M&P 4F3, stuffed, unchanging when injured.

Chemical reactions (stipe surface or trama): SV "carmine" purplish red; 10% $FeSO_4$ pale brownish salmon; 2% phenol slowly dark grayish brown.

Spores cream in mass, D or IIc, 6.4-8.0 x 5.2-6.4 µm, average 7.3 x 6.0 µm, broadly obovate to broadly elliptic; ornamentation of amyloid cylindric to conic warts, 0.6-1.1 µm high, isolated or with a variable number of connectives, short-catenulate or faint lines, not forming a reticulum; suprahilar area a small irregular lightly amyloid patch; hilar appendix inamyloid, somewhat inconspicuous. **Basidia** 29-49 x 10-14 µm, clavate, 4-sterigmate. **Pleurocystidia** scattered, 55-76 x 7-12 µm, subcylindric, subclavate, clavate-fusoid, apices rounded to subacute, often appendiculate or subcapitate, empty or with randomly scattered small refractive masses which are weakly SV+ when fresh, arising from the subhymenium, projecting to 20 µm beyond the basidioles. **Cheilocystidia** more



FIGS. 6-10. *Russula rubellipes* (Fatto 951, holotype). 6. Spores. 7. Cheilocystidia. 8. Pleurocystidia. 9. Hyphal ends from stipe surface. 10. Pileus epicutis, upper portion (dotted line represents surface of gelatinous matrix). Outlined areas in hyphae and cystidia indicate refractive masses.

abundant, 36-56 x 6-9 µm, fusiform or similar to the pleurocystidia, projecting to 22 µm. **Subhymenium** 20-40 µm thick, pseudoparenchymatous with cells 5-12 µm wide. **Trama** without laticiferous or clear vascular hyphae. **Pileus subcutis** 70-140 µm thick, horizontally oriented, interwoven, hyaline, often flexuose hyphae 2-6 µm wide; lacking or with rare short lengths of 4± µm wide, grayish glossy vascular hyphae. **Pileus epicutis** 50-100 µm thick, embedded in a gelatinous matrix most noticeable on young specimens, approaching a "virescens-structure", inflated cells forming a pseudoparenchymatous region with the upper portion a mixture of cylindric, oval, or variously inflated projecting cells, 6-18 µm wide, with rounded apices, and narrow unbranched cylindrical hyphal ends, 20-45 x 2.5-5.5 µm, some ends hyaline, arising from variously inflated cells, the others short primordial hyphae, one to two septate, containing small refractive masses which are SV+ and visibly incrusted when treated with fuchsin. **Stipe cuticle** of longitudinal-interwoven, filamentous, hyaline, septate hyphae 2.4-5.6 µm in diameter, apical cells of projecting ends cylindric to subclavate, sometimes with refractive or granular masses which are weakly SV+.

Habitat solitary on soil in an old growth, predominantly oak-hickory deciduous forest; July through October. Presently, known only from the type area.

MATERIAL EXAMINED: NEW JERSEY: Somerset Co.: Rutgers University's Hutcheson Memorial Forest, 9 Sep 1991, Fatto 642; 4 Oct 1991, Fatto 650; 10 Jul 1996, Fatto 951 (Holotype, NY); 24 Sep 1996, Fatto 991. (Other than holotype, all in RMF personal herbarium.)

OBSERVATIONS: *Russula rubellipes* differs from *R. pseudopeckii* in having a darker red pileus with a subareolate marginal area and a more strongly toned stipe. The spores are similar but slightly larger with longer warts. The pileus epicutis of *R. pseudopeckii* is a filamentous ixotrichoderm while *R. rubellipes* approaches a "virescens-structure" containing some unusually short primordial hyphae in a gelatinous matrix.

Two other red-capped species which exhibit the subsection *Roseinae* attributes of reddening strongly with SV, becoming blackish brown in phenol, having a pileus cuticle with incrusted primordial hyphae and lacking dermatocystidia, may be encountered. *Russula peckii* Singer was redescribed by Shaffer (1970) and commented upon by Bills (1984) who stated that it is constantly associated with conifers, which has also been my experience. This habitat, the rich red pileus and usually strongly pinked stipe, crenulate lamellar edges, mild taste and white spore print are its macroscopic attributes. Microscopically, the spores are predominantly 7.6-8.4 x 6.4-7.2 µm with warts 0.8-1.0 µm high and varying numbers of connectives. The pileus epicutis is an ixotrichoderm about 60 µm thick of various narrow hyphae, some hyaline, others with refractive masses in the terminal cells, and some incrusted primordial hyphae. A very diagnostic feature appears to be the hymenial cystidia which are empty except for a distinctive subtriangular mass in the apex which is SV+ and also strongly refractive when observed in KOH and Melzer's (e.g., Fatto 111, 17 August 1985; Fatto 747, 20 August 1993; Fatto 1102, 27 September 1997).

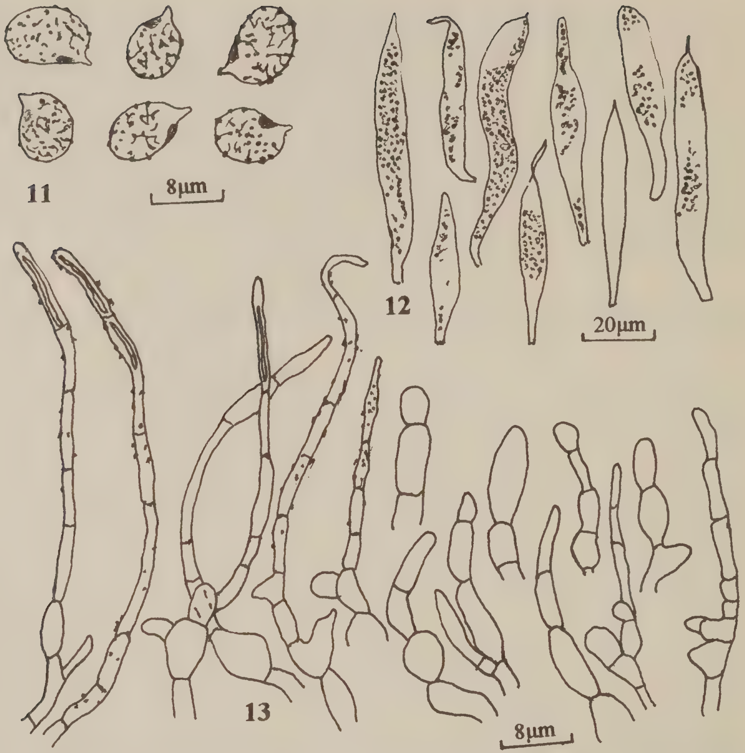
The other species, *R. rosea* Quelet, is less frequently encountered. It exists in mixed deciduous, beech-containing forests. Macroscopically, it is rather nondescript, with a bright red pileus, white stipe, white close lamellae with even margins, mild taste, and a whitish (B) spore print. Microscopically, the spores are mostly 6.4-8.0 x 5.2-6.4 µm with warts 0.4-0.5 µm high and a few fine connectives. The pileus epicutis is an ixotrichoderm about 200 µm thick, with thin, 2-3.5 µm wide, hyaline hyphae and incrusted primordial hyphae. Trama has common clear vascular hyphae 2-5 µm wide. Many of the hymenial cystidia are appendiculate with mostly empty areas and random refractive granules and streaks which are SV+ (e.g., Fatto 608, 1 July 1991).

Russula corallina Burlingham, North American Flora 9: 213. 1915. Figs. 11-13

Pileus 2-4.5 cm broad, hemispherical to convex, maturing to plano-convex with a depressed disc; margin even, sometimes striate to 3 mm inward from the edge in age; cuticle dry, densely pruinose centrally, margin becoming granular, finely areolate, exposing a creamy subsurface, separable 1/4 to 1/2 the radius, around 15 moderate Red, M&P 4J4 in the central area, to marginally 3 deep Pink, M&P 2H4, or 2 strong Pink, M&P 2G3, sometimes with mottled creamy areas around 28 light yellowish Pink, M&P 9A6; trama thin, to 2 mm at mid-radius, firm, creamy white, unchanging when cut, taste mild to belatedly faintly acrid or bitter, odor nil. **Lamellae** 2 mm broad at mid-radius, rounded in front, adnate, subclose, mostly equal, occasionally with a few long lamellulae and/or a few forks, not particularly brittle, edges even, white. **Stipe** 2-4 cm long, 3-10 mm wide, equal to either slightly enlarged or reduced towards the base, dry, glabrous, white but usually tinged with pink on the lower half, solid then becoming spongy-stuffed, unchanging when bruised.

Chemical reactions (stipe surface and trama): SV nil to pale brown; 10% $FeSO_4$ pale salmon-tan; 2% phenol medium brown; formalin colorless; guaiac greenish blue.

Spores whitish in mass, A-B, 6.4-9.0 x 5.2-6.4 µm, broadly obovate to broadly elliptic, ornamentation of amyloid fine warts, 0.1-0.2 µm high and fine lines which randomly connect 2 to 6 warts without any distinct reticulum; suprahilar area small, medium gray in Melzer's; hilar appendix inamyloid, short, rather inconspicuous. **Basidia** 34-42 x 8-12 µm, clavate, 4-sterigmate. **Hymenial cystidia** 40-74 x 7-10 µm, fusiform, ventricose, apices rounded to acute, often appendiculate, empty to banded lightly granular, the granular areas graying in SV when fresh, projecting to 20 µm beyond basidioles, rather scarce. **Subhymenium** 30-50 µm thick, pseudoparenchymatous. **Trama** without vascular hyphae. **Pileus subcutis** 80-140 (-260) µm thick, horizontal-interwoven, nongelatinous, hyaline hyphae, 3-8 µm wide; vascular hyphae present. **Pileus epicutis** 100-220 µm thick, without gelatinous matrix or pileocystidia, a trichoderm of hyaline connective hyphal ends, composed of 2-5 cells, 3-9 µm wide, terminal cells with rounded to elongated or sometimes tapered apices, arising from an area containing variously inflated cells, sometimes to 20 µm wide, almost pseudoparenchymatous; also with



FIGS. 11-13. *Russula corallina* (Burlingham 62-1910, holotype NY). 11. Spores. 12. Hymenial cystidia. 13. Hyphal ends from pileus cuticle.

common incrusted primordial hyphae, 70-150 x 3-5 µm, multi-septate, apical cell cylindric with rounded to aculeate apices, often containing a refractive SV+ mass, sometimes aggregated into fascicles. **Stipe cuticle** of tightly interwoven hyaline hyphae, 2-6 µm wide, projecting end cells sometimes containing a refractive area, without caulocystidia.

Habitat solitary on soil in deciduous and deciduous-coniferous forests, often under white oak (*Quercus alba* L.).

MATERIAL EXAMINED: CONNECTICUT: Fairfield Co.: Redding, 19 Aug 1902, Earle 3637 (NY). Middlesex Co.: Salmon River St. For., 31 Aug 1997, Fatto 1081. MAINE: Cumberland Co.: Bridgton, 17 Aug 1983, Fatto 53. Hancock Co.: S. Brooksville, 25 Jul 1985, Fatto 92; 23 Jul 1987, Fatto 226. NEW JERSEY: Morris Co.: Mendham town park, 28 Jul 1989, Fatto 417; 11 Jul 1993, Fatto 713; 9 Jul 1995, Fatto 874. Monmouth Co.: Shark River, 5 Jul 1981, Fatto 2. RHODE ISLAND: Washington Co.: Kingston, 5 Aug 1988, Fatto 299. VERMONT: Windham Co.: Newfane, 10 Aug 1910, Burlingham 62-1910 (Holotype, NY). Windsor Co.: Ascutney, 30 Aug 1996, Fatto 977. (Unless otherwise indicated, all in RMF personal herbarium).

OBSERVATIONS: Diagnostic characters which often permit field identification are the small stature, distinctive pink pileus coloration with the densely pruinose disc and finely areolate marginal area, firmer than normal trama, slight pinking near the stipe base, and mild to tardily faintly acrid taste. The white spore print, very low wart height, and pileus cuticular structure could confirm the species. Lamellae on one basidioma of the collections examined contained a few misshapen giant spores of 10.4-11.2 x 6.4 µm. Interestingly, the field notes accompanying the Earle collection at NY indicate that Earle probably realized that the collection was undescribed since he recorded it as *Russula (Rigidae)*.

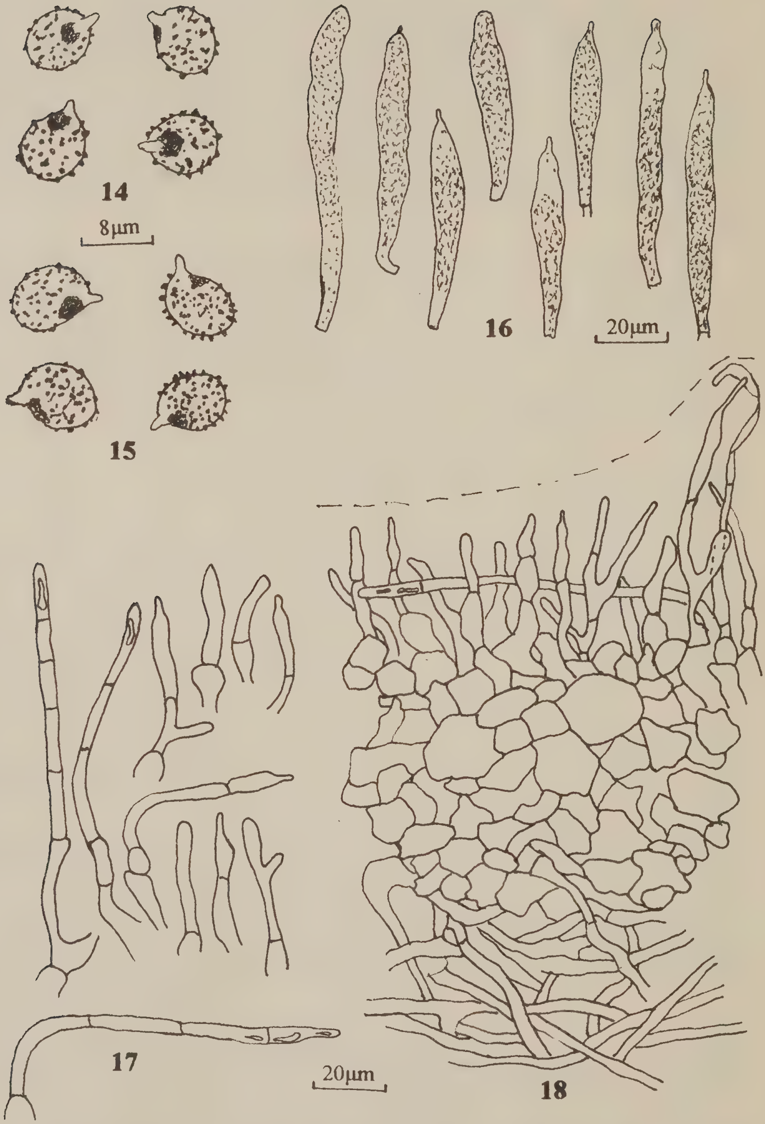
In a discussion of the subsection *Pusillinae*, Singer (1986) stated that *R. corallina* seems to belong to the section *Rigidae* where it might be the type of a special subsection. However, subsection *Lepidinae* seems a reasonable location for *R. corallina* because of its relatively firm flesh, mildish taste, pruinose cuticle with primordial hyphae, conventional $FeSO_4$ and SV reactions, hymenial cystidia only partially weakly graying in SV, and white spore print.

Russula uncialis Peck, N.Y. State Mus. Bull. 1 (No. 2):10. 1887. Figs. 14-18

Pileus 2-4 cm broad, convex, maturing to plane with a slightly depressed disc; margin even, in age faintly tuberculate-striate to 3 mm inward from the edge; cuticle viscid when moist, dull glabrous to faintly pruinose, separable 2/3 to 3/4 the radius, reddish hues variable from 259 dark purplish Red, 16 dark Red, M&P 55L10, M&P 6K4 to 43 moderate reddish Brown, 38 dark reddish Orange, or M&P 7L10, M&P 6L10; trama thin, 1 to 1.5 mm at mid-radius, white, unchanging when injured, taste mild, odor nil. **Lamellae** 3-4 mm broad at mid-radius, broadest in front, adnate, close, equal but with a rare long lamellula or basal fork, edges even, brittle, white. **Stipe** 2-4 cm long, 3-8 mm thick, equal, glabrous, white but usually with some areas tinged pinkish to 5 moderate Pink or M&P 3E3, spongy-stuffed, unchanging when bruised.

Chemical reactions (stipe surface): SV nil; 10% $FeSO_4$ faint salmon-tan; 2% phenol very slowly to medium brown; formalin colorless; guaiac green-blue.

Spores white in mass, A, 6.8-8.8 x 5.6-6.6 µm, obovate to broadly elliptic, ornamentation of amyloid warts 0.3-0.8 µm high which are mostly isolated but occasionally short-catenulate or with a few fine lines connecting 3 or 4 warts; suprahilar area prominently gray in Melzer's; hilar appendix inamyloid, conspicuous. **Basidia** 32-48 x 7-12 µm, clavate, 4-sterigmate. **Hymenial cystidia** 45-90 x 7-12 µm, subcylindric, ventricose to subclavate, apices subacute, many mucronate or short appendiculate, granular and partially SV+ when fresh, some with empty areas, projecting to 40 µm beyond basidioles, common. **Subhymenium** 34-40 µm thick, pseudoparenchymatous. **Trama** without vascular hyphae. **Pileus subcutis** 90-130 µm thick, pseudoparenchymatous, cells 5-22 µm wide, with the lower 20-50 µm consisting of horizontal to ascending hyaline hyphae, 3-6 µm wide, expanding to 12 µm wide when



FIGS. 14-18. *Russula uncialis*. 14. Spores (Peck, holotype NYS). 15. Spores (Fatto 1023). 16. Hymenial cystidia (Fatto 1023). 17. Hyphal ends from pileus cuticle (Peck, holotype NYS). 18. Pileus cuticle (Fatto 1023). The dotted line represents the surface of the gelatinous matrix.

merging into the pseudoparenchymatous cells; without vascular hyphae. **Pileus epicutis** 50-110 µm thick, without pileocystidia, an ixotrichoderm of two types of hyphal ends: a majority of hyaline, 0-2 septate, often constricted, unbranched to once-branched, 3-8 µm wide hyphae, with rounded to subulate apices; and fewer intermixed, multi-septate, primordial hyphae, without incrustation, but with occasional refractive SV+ masses in the terminal cells, 90-140 x 3-5 µm, these hyphae sometimes repent but more often in clusters forming a pyramidal fascicle. **Stipe cuticle** of longitudinal-interwoven, nongelatinous, hyaline hyphae, 2-5 µm wide, with some end cells projecting to form scattered short hairs, without vascular hyphae or caulocystidia.

Habitat solitary on soil in mixed deciduous woods.

MATERIAL EXAMINED: NEW JERSEY: Hunterdon Co.: Oldwick, 23 Aug 1989, Fatto 449. Morris Co.: Mendham town park, 13 Jul 1997, Fatto 1023. Warren Co.: Blairstown, 28 Aug 1989, Fatto 455. NEW YORK: Rensselaer Co.: Sand Lake, 1883, Peck (Holotype, NYS). (Unless otherwise indicated, all in RMF personal herbarium).

OBSERVATIONS: Indicative field characters would be the small size, usually about 3 cm broad and high, fairly uniformly toned red pileus, stipe with pinked areas, close white lamellae, lack of odor, and a mild taste. Further distinguishing features are the white spore print, negative SV reaction, usually isolated fairly short warts, mostly 0.5-0.7 µm high on the medium sized spores, and the distinctive pileal cuticular structure. The thin gelatinous matrix was easily observed in a water mount or when reconstituted in 10% NH_4OH, but for some reason was barely noticeable in 3% KOH and soon became indiscernible. However, the gelatinous matrix was very obvious when the cuticle was treated with fuchsin to establish the absence of incrusting particles on the primordial hyphae.

Russula uncialis is either continually overlooked or a rather rare species in Northeastern North America. The few verified collections consist of only one or two specimens each. Singer placed *R. uncialis* in subsection *Lilaceinae*.

ACKNOWLEDGMENTS

I am grateful to Dr. Robert L. Shaffer of the University of Michigan Herbarium for reviewing this paper and providing helpful comments, Alice Janick for providing the Latin descriptions, Drs. Barbara M. Thiers and Roy Halling of NY for arranging the loan of herbarium specimens, and Dr. John Haines of NYS for the loan and information on the Peck specimen.

LITERATURE CITED

Bills, G. F. 1984. Southern Appalachian Russulas II. **Mycotaxon** 21: 491-517.

Hesler, L. R. 1960. A Study of Russula Types. **Mem. Torrey Bot. Club** 21: 1-59.

Kelly, K. L. & D. B. Judd. 1955. The ISCC-NBS Method of Designating Colors and a Dictionary of Color Names. ISCC-NBS Color-Name Charts Illustrated with Centroid Colors. **National Bureau of Standards Circular 553.** U.S. Government Printing Office, Washington, DC. 158p.

Maerz, A. & M. R. Paul. 1950. **A Dictionary of Color.** 2nd ed. McGraw-Hill Book Co., Inc., NY. 207p.

Pearson, A. A. 1950. The Genus *Russula*. Second Edition. (Separate reprint from The **Naturalist**. London. 1948. No. 824: 85-108.)

Romagnesi, H. 1967. **Les Russules d'Europe et d'Afrique du Nord.** Bordas, Paris. 998p.

Shaffer, R. L. 1970. Notes on the Subsection *Crassotunicatinae* and Other Species of *Russula*. **Lloydia** 33: 49-96.

Singer, R. 1986. **The Agaricales in Modern Taxonomy.** 4th ed. Koeltz Scientific Books, Koenigstein. 981p.

MYCOTAXON

Volume LXVIII, pp. 205-249 July-September 1998

ANNOTATED LIST OF THE PLEOSPORACEAN FUNGI AND RELATED GENERA REPORTED FROM THE IBERIAN PENINSULA AND BALEARIC ISLANDS

J.CHECA

Dpto. Biología Vegetal. Universidad de Alcalá de Henares. 28871 Madrid, Spain.

ABSTRACT

A third checklist of the dothideaceous fungi (pleosporacean and related genera) of the Iberian Peninsula and Balearic Islands, based on bibliographic data and the study of the material, is given. Three new combinations are proposed ; *Chaetoplea inverecunda* (De Not.) Checa, *Comoclathris pyrenophoroides* (Sacc.) Checa and *Montagnula camarae* (M.T. Lucas) Checa.

Keywords : dothideaceous, pleosporacean, Spain, Portugal, chorology.

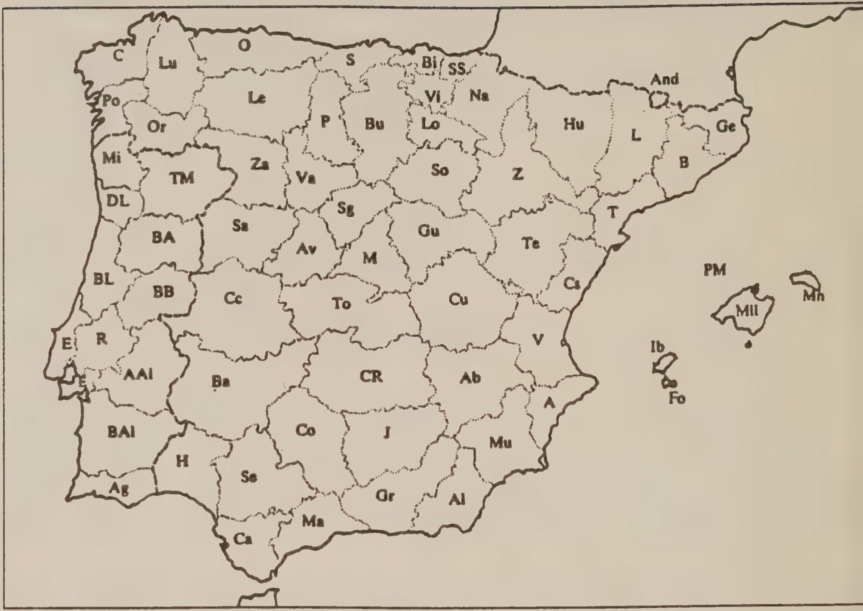
MATERIALS AND METHODS

The catalogue has been compiled of all the generic, specific and infraspecific taxa of *Pleosporaceae* and related genera cited in the Iberian Peninsula and Balearic Islands

The methodology is the same that in the previous papers (CHECA 1997 a, 1997 b). In each species is indicated the chorology (Fig. 1), substrate and herbaria, when the information is available. More information about the Iberian species you can find in CHECA (1997 c). When the study of the Iberian material has been possible, I have indicated the actual nomenclature.

At the end, there is a list with the doubtful and excluded taxa. The criteria for this, are based on the study of the material or are due to the absence of such in the herbaria, specially in those cases when the species are rare or were described as new.

This research has been supported by the DGICYT (PB95-0129, "Flora Micológica Ibérica.III" Project).


C
Lu
O
S
Bi
SS
Po
Le
Vi
Na
And
Or
P
Bu
Lo
Hu
L
Ge
Mi
Za
So
Z
B
TM
Va
DL
Sg
T
Sa
Gu
BA
Av
Te
M
PM
BL
BB
Cs
Cc
To
Cu
Mll
Mn
E
R
V
Ib
AAl
Ba
CR
Ab
Fo
A
E
BAl
Co
J
Mu
H
Se
Ag
Gr
Al
Ma
Ca

ESPAÑA (ESP)
A Alicante
Ab Albacete
Al Almeria
Av Avila
B Barcelona
Ba Badajoz
Bi Vizcaya
Bu Burgos
C La Coruña
Ca Cádiz
Cc Cáceres
Co Córdoba
Cs Castellón
CR Ciudad Real
Cu Cuenca
Ge Gerona
Gr Granada
Gu Guadalajara
H Huelva
Hu Huesca
J Jaén

L Lérida
Le León
Lo La Rioja
Lu Lugo
M Madrid
Ma Málaga
Mu Murcia
Na Navarra
O Asturias
Or Orense
P Palencia
Po Pontevedra
S Cantabria
Sa Salamanca
Se Sevilla
Sg Segovia
So Soria
T Tarragona
Te Teruel
To Toledo
V Valencia
Va Valladolid

Z Zaragoza
Za Zamora

BALEARES
Fo Formentera
Ib Ibiza
Mll Mallorca
Mn Menorca

PORTUGAL (PRT)
AAl Alto Alentejo
BA Beira Alta
BAl Bajo Alentejo
BB Beira Baixa
BL Beira Litoral
DL Douro Litoral
E Estremadura
Mi Minho
R Ribatejo
TM Trás-os-Montes

Fig. 1.- Symbols of each province.

I have followed for the nomenclature, the sensu of BARR (1990 a, 1990 b), HAWKSWORTH & al. (1995) and SHOEMAKER & BABCOCK - (1992). The genera are included in the families *Cucurbitariaceae, Diademaceae, Fenestellaceae, Leptosphaeriaceae, Massariaceae, Micropeltidaceae, Phaeosphaeriaceae and Pleosporaceae.*

Herbaria

The herbaria where the Iberian specimens are deposited are indicated. As most of them maybe unfamiliar I include a list with their corresponding addresses below.

AH.- Departamento de Biología Vegetal. Facultad de Ciencias.Universidad de Alcalá de Henares, 28871 Madrid. Spain.

COI.- Jardim Botânico. Departamento de Botânica (Instituto Botânico Dr. Júlio Henriques). Universidade de Coimbra. Coimbra (Portugal).

FMR.- Unitat de Microbiología. Universitat Rovira i Virgili. Facultat de Medicina. C/ Sant llorenç, 21. 43201 Reus (Spain).

"Herb. DSL"- Private herbarium of D. Sierra. Departamento de Biología Vegetal, Facultad de Biología, Universidad de Barcelona. 08071 Barcelona. Spain.

"Herb. EGA".- Private herbarium of E. Gallego. Departamento de Biología Vegetal, Facultad de Biología. Universidad de Murcia. 30071 Murcia. Spain.

"Herb. HJCh.-GM."- Private herbarium of J.Checa & G. Moreno, deposited in AH.

"Herb. JL."- Private herbarium of J. Larios. Departamento de Biología Vegetal, Facultad de Biología. Universidad de Murcia. 30071 Murcia. Spain.

"Herb. MHG."- Private herbarium of M. Honrubia. Departamento de Biología Vegetal, Facultad de Biología. Universidad de Murcia. 30071 Murcia. Spain.

LISE.- Fitosistemática e Geobotânica, Estaçao Agronómica Nacional. P-2780. Oeiras. Portugal.

LISFA.- Conservaçao dos Recursos Naturais, Estaçao Florestal Nacional de Investigaçao Agrária, P-130. Lisboa. Portugal

MA-Fungi.- Real Jardín Botánico, C.S.I.C., PLaza de Murillo 2. 28014 Madrid. Spain.

BIBLIOGRAPHY SURVEYED FOR THE COMPILATION OF THE CATALOGUE

1).- ALMEIDA, J. VERÍSSIMO (1903). Contribution à la Mycoflore du Portugal. Tytp. La Bécarre. Lisboa.

2).- ALMEIDA, J. VERÍSSIMO & CÂMARA, M.SOUSA (1909). Contributiones ad mycofloram lusitaniae. Centuriae III. IV, V. Bol. Soc. Brot. 24:150-213.

3).- ARANZADI, T.(1897). Setas u hongos del País Vasco. Librería de Romo y Füssel. Madrid.

4).- BAUSÁ, M. (1945). Datos micológicos. Anales Jard. Bot. Madrid 5:143-160.

5).- BAUSÁ, M. (1946). Notas sobre micromicetos de España. Anales Jard. Bot. Madrid 6(1) :399-416.

6).- BAUSÁ, M. (1948). Hongos microscópicos de los alrededores de La Alberca (Salamanca). Anales Jard. Bot. Madrid 7 :457-500

7).- BENITO MARTÍNEZ, J. (1930). Algunos datos acerca de los hongos que viven sobre matriz vegetal y principalmente leñosa. Bol. Soc. Esp. Hist. Nat. 30 :323-327.

8).- BERLESE, A.N. & ROUMEGUÈRE, C. (1887). Contributiones ad Floram mycologicam Lusitaniae. Fungi Lusitanici a Cl. Moller lecti. Rev. Mycol. (Toulouse) 9(36) :161-165.

9).- BERLESE, A.N., SACCARDO,F. & ROUMEGUÈRE, C. (1889). Contributiones ad Floram mycologicam Lusitaniae. Fungi Lusitanici a Cl. Moller lecti. Rev. Mycol. (Toulouse) 11(43) :117-124.

10).- CABALLERO, a. (1941). Micromicetos del Jardín Botánico de Valencia. Anales Jard. Bot. Madrid 1 :173-200.

11).- CALONGE, F.D., TORRE, M. DE LA, TELLERÍA, M.T. & VERDE DE MILLAN,L. (1978). Aportación al catálogo de los hongos del Real Jardín Botánico de Madrid. Bol. Estac. Centr. Ecol. 7(13):33-47.

12).- CÂMARA, M. SOUSA (1910). Contributiones ad mycolfloram Lusitaniae. Centuria VI. Bol. Soc. Brot. 25:5-25.

13).- CÂMARA, M. SOUSA (1930). Contributiones ad mycofloram Lusitaniae. Centuriae VIII et IX. Anais Inst. Super. Agron. 3 :59-141.

14).- CÂMARA, M. SOUSA (1936). Contributiones ad mycofloram Lusitaniae. Centuria XI. Bol. Agric. (Lisboa), I Sér. 2(1) :1-80.

15).- CÂMARA, M. SOUSA (1946). Contributiones ad mycofloram Lusitaniae. Centuria XII. Agron. Lusit. 8(1):19-71.

16).- CÂMARA, M. SOUSA (1947). Mycetes aliquot Lusitaniae VII. Agron. Lusit. 9(2):85-128.

17).- CÂMARA, M. SOUSA (1948). Mycetes aliquot Lusitaniae VIII. Agron. Lusit. 10(4) :279-320

18).- CÂMARA, M. SOUSA (1948). Enumeraçao dos micetas encontrados até agora nas oliveiras, em Portugal, e particularmente algumas consideraçoes sobre as doenças mais vulagares e mais perigosas da mesma árvore, a eles devidas. II Congr. Ribatejano:407-424.

19).- CÂMARA, M. SOUSA (1949). Mycetes aliquot Lusitaniae X. Agron. Lusit. 11(3): 165-189.

20).- CÂMARA, M. SOUSA (1950). Catalogus Fungorum Juresi (Serra do Gerês) ad Mycofloram Lusitanicam. Agron. Lusit. 12(1):89-122.

21).- CÂMARA, M. SOUSA (1951). Mycetes aliquot Lusitaniae XI. Agron. Lusit. 13(2):117-151.

22).- CÂMARA, M. SOUSA (1951). Mycetes aliquot Lusitaniae XII. Agron. Lusit. 13(3): 185-212.

23).- CÂMARA, M. SOUSA & LUZ, C.G. (1939). Mycetes aliquot Lusitaniae. III. Agron. Lusit. 1(2) :167-199.

24).- CÂMARA, M. SOUSA & LUZ, C.G. (1941). Mycetes aliquot Lusitaniae. IV. Agron. Lusit. 3(1):25-47.

25).- CÂMARA, M. SOUSA & LUZ, C.G. (1943). Mycetes aliquot Lusitaniae VI. Agron. Lusit. 5(2):119-145.

26).- CÂMARA, M. SOUSA & LUZ, C.G. (1944). Mycetes aliquot Lusitaniae.IV. Bol. Soc. Portug. Ci. Nat. 13(Supl. II):126-140.

27).- CÂMARA, M. SOUSA & VASCONCELOS, A.T. (1952). Fungi Lusitaniae. III. Agron. Lusit. 14(4) : 249-257.

28).- CHECA, J., (1990). Estudios sobre Pyrenomycetes y Loculoascomycetes (Ascomycotina),V. Dothideales y Lecanidiales. Bol. Soc. Micol. Madrid 14:99-106.

29).- CHECA, J. (1994). Pyrenomycetes s. lato de reservas naturales ibéricas. Bol. Soc. Micol. Madrid 19:3-14.

30).- CHECA, J. (1995). Pyrenomycetes s. lato de reservas naturales ibéricas. II. Bol. Soc. Micol. Madrid 20:91-97.

31).- CHECA, J. (1997). Cuadernos de Flora Micológica Ibérica (in print).

32).- CHECA, J. & MORENO, G. (1984). Estudios sobre Pyrenomycetes y Loculoascomycetes (Ascomycotina).I. Bol. Soc. Micol. Castellana 8:15-22.

33).- CHECA, J. & MORENO, G. (1985) .Estudios sobre Pyrenomycetes y Loculoascomycetes (Ascomycotina).II. Bol. Soc. Micol. Castellana 9:5-14.

34).- COSTA,M.E. & CÂMARA,M. SOUSA (1955). Fungi Lusitaniae.X In:Anónimo (Ed.), Lusitaniae Mycologica et Phytopathologica:94.

35).- DIAS, M.R. SOUSA & CÂMARA, M. SOUSA (1955). Fungi Lusitaniae. Agron. Lusit. 17(2/4) :101-113.

36).- DIAS, M.R. SOUSA & LUCAS, M.T. (1962). Fungi Lusitaniae. XIX. Agron. Lusit. 24(1):39-43

37).- DIAS, M.R. SOUSA & LUCAS, M.T. (1965). Fungi Lusitaniae. XX. Agron. Lusit. 26(1):5-19.

38).- DIAS, M.R. SOUSA & LUCAS, M.T. (1972). FUNGI LUSITANIAE. AGRON. LUSIT. 33(1/4): 173-184.

39).- DIAS, M.R. SOUSA, LUCAS, M.T., SAMPAIO, M.H. & SANTOS (1971). Fungi. In: Catálogo das plantas herborizadas. III Reuniao de Botânica Peninsular. Mem. Soc. Brot., Sér. 2, 21: 65-89.

40).- FERNÁNDEZ RIOFRÍO, B. (1922). Datos para la flora micológica de Cataluña y Baleares. Bol. Soc. Esp. Hist. Nat. 23 :192-195.

41).- FERNÁNDEZ RIOFRÍO, B. (1923). Datos para la flora micológica de Cataluña. Bol. Soc. Esp. Hist. Nat. 22 :200-204.

42).- FERNÁNDEZ RIOFRÍO, B. (1929). Nuevas aportaciones a la micología española. Mem. Real Soc. Esp. Hist. Nat. 15(1):383-388.

43).- GALLEGO, E., PEDREÑO, J.G. & HONRUBIA, M. (1986). Notas sobre micromicetes epífitos del campo de Cartagena (S.E. de España). Anales Biol. Secc. Biol. Veg. (Murcia) 9 :21-34.

44).- GARCÍA BONA, L.M. (1987). Catálogo micológico de Navarra. Cuad. Secc. Ci. Nat. 3:9-287.

45).- GONZÁLEZ FRAGOSO, R. (1914). Contribución a la Flora micológica española. Bol. Soc. Esp. Hist. Nat. 14 :137-152.

46).- GONZÁLEZ FRAGOSO, R. (1914). Contribución a la flora miológica de Guadarrama. Pireniales. Histeriales. Discales. Trab. Mus. Nac. Ci.Nat., Ser. Bot. 4:1-43.

47).- GONZÁLEZ FRAGOSO, R. (1914). Contribución a la flora miológica de Guadarrama. s.Deuteromicetos. Trab. Mus. Nac. Ci.Nat., Ser. Bot. 5 :1-46.

48).- GONZÁLEZ FRAGOSO, R. (1914). Nueva contribución a la flora miológica de Guadarrama. (Teleomicetos y Deuteromicetos). Trab. Mus. Nac. Ci.Nat., Ser. Bot. 7 :1-80

49).- GONZÁLEZ FRAGOSO, R. (1916). Micromicetos varios de España y de Cerdaña. Trab. Mus. Nac. Ci. Nat., Ser. Bot. 9 :1-115.

50).- GONZÁLEZ FRAGOSO, R. (1916). Bosquejo de una Flórula Hispalense de Micromicetos. Trab. Mus. Nac. Ci. Nat., Ser. Bot. 10:1-221.

51).- GONZÁLEZ FRAGOSO, R. (1917). Fungi novi vel minus cogniti Horti Botanici Matritensis. Trab. Mus. Nac. Ci. Nat., Ser. Bot. 12:1-99.

52).- GONZÁLEZ FRAGOSO, R. (1917). Introducción al estudio de la flórula de micromicetos de Cataluña. Treb. Inst. Bot. Barcelona 1(2) :1-187.

53).- GONZÁLEZ FRAGOSO, R. (1918). Notas para la microflórula matritense. Bol. Soc. Esp. Hist. Nat. 18 :363-376.

54).- GONZÁLEZ FRAGOSO, R. (1919). Anotaciones micológicas. Hongos de Cataluña. Mem. Real Soc. Esp. Hist. Nat. 11(3):77-103.

55).- GONZÁLEZ FRAGOSO, R. (1921). Algunos hongos del herbario del Museo de Ciencias Naturales de Barcelona. Butll. Inst. Catalana Hist. Nat. 21 :99-106

56).- GONZÁLEZ FRAGOSO, R. (1923). Contribución a la flora micológica lusitánica. Bol. Soc. Brot., Sér. 2, 2:3-83.

57).- GONZÁLEZ FRAGOSO, R. (1923). Hongos del Jardín Botánico de Madrid. Bol. Soc. Esp. Hist. Nat. 23 :315-329.

58).- GONZÁLEZ FRAGOSO, R. (1924). Datos para el conocimiento de la micoflora ibérica. Bol. Soc. Esp. Hist. Nat. 24 :440-452.

59).- GONZÁLEZ FRAGOSO, R. (1924). Hongos de España. Brotéria 21(3) :114-127.

60).- GONZÁLEZ FRAGOSO, R. (1924). Hongos del Herbario del Museo de Ciencias Naturales de Barcelona (Serie 7). Butl. Inst. Catalana Hist. Nat. 24:123-130.

61).- GONZÁLEZ FRAGOSO, R. (1925). Adiciones a la micoflora lusitánica. Asoc. Esp. Progr. Ci. Congr. Coimbra (Ci. Nat.) 6:5-27.

62).- GONZÁLEZ FRAGOSO, R. (1926). Hongos de España. (2. Serie). Brotéria, Sér. Bot. 22(2):49-70.

63).- GONZÁLEZ FRAGOSO, R. (1927). Tres notas micológicas: I. Algunos hongos de los Pirineos españoles recolectados por la Srta. Paunero. II. Hongos pirenaicos, y otros, del herbario del Museo de Ciencias Naturales de Barcelona. III. Algunos hongos. Bol. Soc. Esp. Hist. Nat. 27:346-358.

64).- HONRUBIA, M., ALCARAZ, F., GRACIA, E. & LLIMONA, X. (1982). El componente fúngico de las principales comunidades vegetales del SE de España. Lazaroa 4:313-325.

65).- HONRUBIA, M., BERTAULT, R. & LLIMONA, X.(1982). Aportación al conocimiento de los hongos del S.E. de España XIII. Plectomicetes. Loculoascomicetes. Pirenomicetes. Int. J. Mycol. Lichenol. 1(1):1-26.

66).- HONRUBIA, M., LARIOS, J.M. & GALLEGO, E.(1985). Notas sobre Ascomycotina en el S.E. de España peninsular. Anales Jard. Bot. Madrid 42(1):39-48.

67).- KNOCHE, H.(1921). Flora Balearica. Étude phytogéographique sur les illes Baléares vol. 1. Imp. Roumégos et Déhan. Montpellier.

68).- LARIOS, J.M., HONRUBIA, M. & GALLEGO, E. (1988). Notas sobre Ascomycotina en el S.E. de España peninsular. V. Pirenomicetos y Loculoascomicetos saprófitos. Int. J. Micol. Lichenol. 3(2-3):303-317.

69).- LARIOS, J.M., HONRUBIA, M. & MORENO, G.(1986). Estudio de los hongos que fructifican en la vegetación relicta de Abies pinsapo Boiss., en España peninsular. I. Ascomycotina. Acta Bot. Malacitana 11:39-53.

70).- LARIOS, J.M., HONRUBIA, M. & MORENO, G. (1988). Estudio de los hongos que fructifican en la vegetación relicta de Abies pinsapo Boiss., en España peninsular. II. Ascomycotina. Acta Bot. Malacitana 13:91-110.

71).- LÁZARO E IBIZA, B. (1920). Botánica descriptiva. Compendio de la Flora Española y estudio especial de las plantas criptógamas y fanerógamas... Tomo I. 3ª de. Imprenta Clásica Española. Madrid

72).- LOSA ESPAÑA, T.M. (1945). Aportaciones a la flora de micromicetes del Pirineo español. Anales Jard. Bot. Madrid 5 :79-126.

73).- LOSA ESPAÑA, T.M. (1946). Hongos de Galicia. Anales Jard. Bot. Madrid 6(1) :417-471.

74).- LOSA ESPAÑA, T.M. (1949). Micromicetes del Pirineo español. Anales Jard. Bot. Madrid 8:297-338.

75).- LOSA ESPAÑA, T.M. (1952). Notas Micológicas. Collect. Bot. (Barcelona). 3(2) :147-161.

76).- LOSA ESPAÑA, T.M. (1957). Micromicetos de Cataluña. Collect. Bot. (Barcelona). 5(2) :367-375.

77).- LOSANTOS, A.P., BASCONES, J.C., EDERRA, A. & LÓPEZ-FERNANDEZ, M.L. (1983). Catálogo de Ascomycetes de Navarra. Publ. Biol. Univ. Navarra, Ser. Bot. 3:3-33.

78).- LOSCOS, F. (1886). Tratado de las plantas de Aragón con suplementos. Edición del Seminario Farmaceútico. Madrid.

79).- LUCAS, M.T. (1956). Fungi Lusitaniae. XIV. Agron. Lusit. 18(2):109-122.

80).- LUCAS, M.T. (1965). Two species of Pleospora on succulents and their life History. Trans. Brit. Mycol. Soc. 48 :415-416.

81).- LUCAS, M.T. (1971). Some Leptosphaeria and Pleospora species from the southern and south-western regions of Portugal. Mem. Soc. Brot. 21:33-47.

82).- LUCAS, M.T. & CÂMARA, M. SOUSA (1953). Fungi Lusitaniae. V. Agron. Lusit. 15(2): 153-182.

83).- LUCAS, M.T. & CÂMARA, M. SOUSA (1954). Fungi Lusitaniae. VIII. Agron. Lusit. 16(2):81-109.

84).- LUCAS, M.T. & CÂMARA, M. SOUSA (1955). Fungi Lusitaniae. XII. Agron. Lusit. 17(2/4):115-134.

85).- LUCAS, M.T. & WEBSTER, J. (1964). Conidia of Pleospora scirpicola and P. valesiaca Trans. Brit. Mycol. Soc. 47 :247-256

86).- LUCAS, M.T., DIAS, M.R. SOUSA & SEQUEIRA, M. (1979). Alguns fungos da beterraba-sacarina em Portugal. Agron. Lusit. 39(4) :361-375.

87).- MAIRE, R. (1938). Pugillus Fungorum Nevadensium. Cavanillesia 8(9-10) :133-137.

88).- MALENÇON, G. & BERTAULT, R. (1972). Champignons de la Péninsule Ibérique . IV Les Iles Baléares. Acta Phytotax. Barcinon. 11:1-64.

89).- MALENÇON, G. & BERTAULT, R. (1976). Champignons de la Péninsule Ibérique.V. Catalogne, Aragon, Andalousie. Acta Phytotax. Barcinon. 19:1-68.

90).- NADAL, M., MONTOS, C. & SERRA, F. (1982). Micosis determinades en plantes analitzade pel Laboratori de Diagnostic del Servai de Protecció dels vegetal. VIII Jornadas de Productos Fitosanitarios : 85-99. Barcelona.

91).- NIESSL, G. (1883). Contributiones ad floram mycologicam lusitanicam. Series IV. Instituto (Coimbra), Sér. 2, 31(3):133-143.

92).- PAÚL Y AROZARENA, M. (1897). Datos para la flórula sevillana. Anales Soc. Esp. Hist. Nat. 26 (actas) :255-259.

93).- PETRAK, F. (1931). Mykologische Beiträge zur Flora von Spanien, Portugal und der Insel Madera. Ann. Mycol. 29:107-128. 1931

94).- REZENDE-PINTO, M.C. (1940). IV Contribuiçao para a flora criptogâmica do Norte de Portugal. Brotéria, Sér. Ci. Nat. 9(3): 113-130.

95).- RICK, J. (1905). Fungos dos arrededores de Torres Vedras. Brotéria, Sér. Bot. 4:159-163.

96).- ROLLAND, L. (1905). Champignons des Iles Baléares. Récoltés principalement dans la région montagneuse de Sóller (suite). Bull. Soc. Mycol. France 21(1):21-38.

97).-SACCARDO, P.A. (1883). Sylloge Fungorum Omnium Hucusque Cogniturum. Vol. II. Patavii.

98).- SACCARDO, P.A. (1893). Florula mycologica lusitanica, sistens contributionen decimam ad eamden floram nec non conspectumfungorum omnium in lusitania hucusque observatorum. Bol. Soc. Brot. 11:9-70.

99).- SACCARDO, P.A. (1903). Florae Mycologicae Lusitanicae. Contributio duodecima. Bol. Soc. Brot. 19:156-171.

100).- SANTOS, A.C. (1962). Notas sobre a micoflora de Portugal. I. Agron. Lusit. 24(4):257-271.

101).- SIERRA, M.D.(1987). Aportación al conocimiento de los Ascomycetes (Ascomycotina) de Cataluña.Edic. especials de la Societat catalana de Micologia. vol. 1. Barcelona.

102).- THÜMEN, F. (1881). Contributiones ad floram mycologicam lusitanicam. Series III. Instituto (Coimbra), Sér. 2, 28(8): 359-370.

103).- TRAVERSO, G.B. & SPESSA, C. (1910). La flora micológica del Portogallo. Bol. Soc. Brot. 25 :26-187.

104).- UNAMUNO, L.M. (1921). Nueva contribución al estudio de la flora micológica de la provincia de Oviedo. Asoc. Esp. Progr. Ci. Congr. Oporto (Ci. Nat.) 6 :83-98.

105).- UNAMUNO, L.M. (1921). Algunos datos nuevos para el estudio de la flora micológica de la provincia de Oviedo. Mem. Real Soc. Esp. Hist. Nat. t. extr.:150-168.

106).- UNAMUNO, L.M. (1923). Nuevos datos para el estudio de la micoflora del oriente de Asturias. Asoc. Esp. Progr. Ci. Congr. Salamanca 37-51.

107).- UNAMUNO, L.M. (1925). Datos para el estudio de los hongos microscópicos de los alrededores de Santander. Asoc. Esp. Progr. Ci. Congr. Coimbra (Ci. Nat.) 6 :163-176.

108).- UNAMUNO, L.M. (1929). Hongos microscópicos de los alrededores de La Vid (Burgos). Bol. Soc. Esp. Hist. Nat. 29 :387-402.

109).- UNAMUNO, L.M. (1929). Nuevos datos para el estudio de la flora micológica de los alrededores de Llanes (Asturias). Mem. Real Soc. Esp. Hist. Nat. 15(1) :345-354.

110).- UNAMUNO, L.M. (1930). Nueva aportación al estudio de la Flora Micológica del Concejo de Llanes (Asturias). Bol. Soc. Esp. Hist. Nat. 30 :179-187.

111).- UNAMUNO, L.M. (1930). Nueva aportación a la micología española. Bol. Soc. Esp. Hist. Nat. 30 :287-301.

112).- UNAMUNO, L.M. (1930). Hongos microscópicos de los alrededores de Caudete (Albacete). Bol. Soc. Esp. Hist. Nat. 30 :379-390.

113).- UNAMUNO, L.M. (1931). Relliquiae Fragosoanae. Bol. Soc. Esp. Hist. Nat. 31 : 197-199.

114).- UNAMUNO, L.M. (1933). Contribución al estudio de los hongos microscópicos de Galicia. Revista Real Acad. Ci. Madrid 30 :460-518

115).- UNAMUNO, L.M. (1934). Notas micológicas. VIII. Bol. Soc. Esp. Hist. Nat. 34 :249-259.

116).- UNAMUNO, L.M. (1935). Algunas novedades micológicas de la flora española. Asoc. Esp. Progr. Ci. XV. Congr. Santiago de Compostela :146-166.

117).- UNAMUNO, L.M. (1941). Nueva contribución al estudio de los hongos microscópicos de la flora española. Anales Jard. Bot. Madrid 1 :9-58.

118).- UNAMUNO, L.M. (1941). Enumeración y distribución geográfica de los Ascomicetos de la Península Ibérica y de las Islas Baleares. Mem. Real. Acad. Ci. Exact. Madrid 8:1-403.

119).- UNAMUNO, L.M. (1942). Contribución al estudio de los hongos microscópicos de la provincia de Cuenca . Anales Jard. Bot. Madrid 2 :7-86.

120).- UNAMUNO, L.M. (1943).- Algunas novedades de la micoflora española. Asoc. Portug. Progres. Ci. Congr. Porto 5 :351-369.

121).- UNAMUNO, L.M. (1944). Notas micológicas. Anales Jard. Bot. Madrid 4 :145-166

122).- URRÍES, M.J. (1932). Datos sobre micromicetos de la provincia de Huesca. Bol. Soc. Esp. Hist. Nat. 32:213-229.
123).- URRÍES, M.J. (1933). Algunos datos para la flora española de micromicetos. Bol. Soc. Esp. Hist. Nat. 33:91-104.
124).- URRÍES, M.J. (1941). Datos para la flora española de micromicetos (segunda nota). Anales Jard. Bot. Madrid 1(1):59-78 [1940].
125).- URRÍES, M.J. (1942). Hongos microscópicos de Navarra. Anales Jard. Bot. Madrid 2:143-171.
126).- URRÍES, M.J. (1944). Hongos microscópicos del valle de Benasque (Pirineos aragoneses). Anales. Jard. Bot. Madrid. 4:167-193. 182.
127).- URRÍES, M.J. (1947). Acerca de unos cultivos monospóricos de Pleospora herbarum (Pers.) Rab. Bol. Soc. Esp. Hist. Nat. 45 :367-368.
128).- URRÍES, M.J. (1953). Notas micológicas. Anales Inst. Bot. Cavanilles 10(2) :193-228.
129).- VALLDOSERA, M. & GUARRO, J. (1992). Estudios sobre hongos coprófilos aislados en España. XVII. Ascomycotina. Bol. Soc. Micol. Madrid 17 :19-37
130).- WINTER, G. (1884). Contributiones ad floram mycologicam lusitanicam. Series V. Bol. Soc. Brot. 2:32-57.
131).- WINTER, G. (1884). Contributiones ad floram mycologicam lusitanicam. Series V. Instituto (Coimbra), Sér. 2, 32(4): 195-200.
132).- WINTER, G. (1885). Contributiones ad floram mycologicam lusitanicam. Series VI. Bol. Soc. Brot. 3(1):50-64.
133).- WINTER, G. (1886). Contributiones ad floram mycologicam lusitanicam. Series VI. Instituto (Coimbra) 34(4):186-192.

CATALOGUE

CHAETOPLEA (Sacc.) Clements in Clements & Shear, Genera of Fungi : 275. 1931
Pyrenophora subg. *Chaetoplea* Sacc., Syll. Fung. 2 :279 1883
= *Pleospora* subg. *Cylindrosporeae* Wehm., A world Monograph of the Genus *Pleospora* and its Segregates :233. 1961
Typus.- *Chaetoplea calvescens* (Fr. ex Desm.) Clements

Chaetoplea inverecunda (De Not.) Checa, nov. comb.
≡ *Sphaeria inverecunda* De Not., Mem. Accad. Sci. Torino, ser. 2, 13:102. 1850
Typus.- In FH (isotype), on *Opuntia* (Rab. Fung. Eur. 2329). (WEHMEYER, 1961).

Pleospora inverecunda (De Not.) Ces., in Rabenh., Fung. Eur. :2329 (1860)
Teichospora inverecunda (De Not.) Sacc., in Roum., Rev. Mycol. (Tolouse) 9 :28 (1887)

Chorology: ESP.- Mll (95); Se (44), (49), (117). PRT.- Without locality (79)
Substrate: *Opuntia ficus-indica, Opuntia vulgaris*
Herbaria: LISE

Observations : The partially sclerotial-celled peridium cells, the lightly pigmented ascospores and the abundant hyphae over the surface, suggest the insertion of this species in the genus *Chaetoplea*, even though does not have collabent ascomata.

Chaetoplea oblongata (Niessl) M.E.Barr, Mem. New York Bot. Gar. 62:55. 1990
≡ *Pleospora oblongata* Niessl, Verh. Naturf. Vereins Brünn 14:177. 1876
Typus.- In M (ex Niessl Herb.) (neotype), Schriebwald, on *Coronilla varia,* Aug. 1876. (WEHMEYER, 1961).

Chorology: ESP. Cu (118) (119). PRT. Ag (39), (81)
Substrate: *Digitalis obscura, Thymus camphoratus, Trifolium pratense.*
Herbaria: LISE, MA-Fungi

Chaetoplea stenocarpa (Ellis & Everh.) M.E.Barr, Mem. New York Bot. Gar. 62:53. 1990
≡ *Cucurbitaria stenocarpa* Ellis & Everh, Proc. Acad. Nat. Sci. Philadelphia 47:420. 1895
Typus.- In NY (holotype). U.S.A., California, Los Angeles Co., Pasadena, on *Rhus diversiloba*, Aug. 1884, A.J. McClathie 766 (BARR, 1990 a)

Chorology: PRT.- E (31)
Substrate: *Lavandula* sp.,
Herbaria: LISE

Chaetoplea variabilis (Ellis & Everh.) M.E.Barr, Mem. New York Bot. Gar. 62:54. 1990
≡ *Teichospora variabilis* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 45:131. 1894
Typus.- In NY (holotype).U.S.A., Montana, Madison Co., Sheridan, Jun. 1892, Mrs. Fitch s.n. (BARR, 1990 a)

Chorology: ESP.- Se (50), (118)

Substrate:: *Olea europea*,
Herbaria: MA-Fungi

COMOCLATHRIS Clements, Minn. Bot. Stud. 4:185. 1911
= *Platyspora* Wehm., A World Monograph of the Genus *Pleospora* and its Segregates : 254. 1961
Typus.- *Comoclathris lanata* Clements, Minn. Bot. Stud. 4:185. 1911

Comoclathris compressa (Harkn.) Shoemaker & C.E.Babc., Canad. J. Bot. 70:1628. 1992
≡ *Pleospora compressa* Harkn. Bull. Calif. Acad. Sci. 1 :45. 1884
Typus.- Ind. Loc.- On dead stems of *Polygonum polymorphum*. Blue Cañon, June 3824 (SHOEMAKER & BABCOCK, 1992)

Chorology: ESP. Hu (118), (122), M (118)
Substrate: *Santolina chamaecyparissus*.
Herbaria: MA-Fungi

Observations : This species is closed to *C. permunda* (Cooke) E.Müll. WEHMEYER (1961) only considered the last species. The ascospores are fusoid in *C. compressa* and ovoid in *C. permunda*, but the size is similar in both of them. According to SHOEMAKER & BABCOCK (1992) I have registered both.

Comoclathris pentamera (P.Karst.) S.Ahmad, Monogr. Biol. Soc. Pak. 8:68. 1979
≡ *Pleospora pentamera* P.Karst., Acta Soc. Fauna Fl. Fenn. 2(6):38. 1885
Typus.- In UPS (lectotype). Spitzbergen, Advent Bay, on *Calamagrostis stricta* (Timm.) Koeler (=*C. neglecta* auct., non (Ehrh.) Beauv.) 4-VIII-1868, Th.M. Fries

Chorology: ESP.- M (46) (118); Sa (6)
Substrate: *Arrhenaterum eltius, Abelia triflora, Luzula lactea,*
Herbaria: MA-Fungi

Comoclathris permunda (Cooke) E.Müll., Beitr. Kryptogamenfl. Schweiz 15(1):66. 1977
≡ *Sphaeria permunda* Cooke, Grevillea 5:111. 1876
Typus.- Ind. Loc. U.S.A., California, on stems of soap plant (*Chlorogalum pomeridianum* (DC.) Kunth.), N° 244 (SHOEMAKER & BABCOCK, 1992)

Pleospora permunda (Cooke) Sacc., Syll. Fung. 2:243. 1883
= *Pleospora daucina* Sacc., Michelia 2:322. 1881
= *Pleospora oligomera* Sacc. & Speg., Michelia 1:408. 1878

Chorology: ESP.- B (54), (101), (118); Gr (93), (118); J (93), (118); M (53), (118); Se (50), (118).PRT. E, (15).
Substrate: *Atriplex halymum, Bupleurum spinosum, Cakile maritima, Eryngium campestre, Lactuca tenerrima, Senecio tournefortii* var. *granatensis, Solanum dulcamara, Wistaria chinensis.*
Herbaria: MA-Fungi

Comoclathris planispora (Ellis) Harr, Nova Hedwigia 20(3-4):868. 1971
≡ *Pleospora planispora* Ellis, Bull. Torrey Bot. Club 10:53. 1883
Typus.- In NY (ex Ellis collection) . U.S.A., Utah Territory (Pleasant Valley), on *Elymus* sp., dead culms, mostly on sheaths, winter 1882, S.J. Harkness. (SHOEMAKER & BABCOCK, 1992).

Chorology: PRT. E (31).
Substrate: unidentified stem (probably *Cyperus* or *Carex*)
Herbaria: LISE

Comoclathris pyrenophoroides (Sacc.) Checa, nov. comb.
≡ *Pleospora pyrenophoroides* Sacc., Fung. Ven. 2 :309. 1875
Clathrospora pyrenophoroides (Sacc.) Berl., Nuovo Giorn. Bot. Ital. 20 :198. 1888

Chorology: PRT. BL (118), (130), (131).
Substrate: *Dactylis hispanica*
Herbaria: COI

Observations : WEHMEYER (1961) indicated that the only collection in the Saccardo herbarium is not the type. BERLESE (1888) combined this species to the genus *Clathrospora*, but the ascospores have only one vertical septum in frontal view and for this reason it belongs to the genus *Comoclathris.* I propose a new combination *Comoclathris pyrenophoroides* (Sacc.) Checa.

Comoclathris quadriseptata (Cooke & Harkn.) Shoemaker & C.E.Babc. Canad. J. Bot. 70:1638. 1992
≡ *Pleospora quadriseptata* Cooke & Harkn., Grevillea 14:10. 1885
Typus.- Ind. Loc. U.S.A., California, on pods of gillyflower (*Mathiola incana*), Harkness 2184 (SHOEMAKER & BABCOCK, 1992)

Chorology: ESP.- Av (5); M (53), (118).
Substrate: *Dianthus brachyanthus, Viburnum opulus*
Herbaria: MA-Fungi

CUCURBIDOTHIS Petrak, Ann. Mycol. 19:201. 1921
Typus.- *Cucurbidothis pithyophila* Schmidt & Kunze:Fr.

Cucurbidothis pithyophila (Schmidt & Kunze:Fr.) Petrak var. **pithyophila,** Ann. Mycol. 19:201. 1921
≡ *Sphaeria pithyophila* Schmidt & Kunze:Fr., Syst. mycol. 2:425. 1823

Chorology: ESP.- Ge (101).
Substrate: *Pinus uncinata*
Herbaria: "Herb. DSL"

CUCURBITARIA Gray, Nat. Arr. Brit. Pl. 1:519. 1821
Lectotype.- *Cucurbitaria berberidis* (Pers.:Fr.) Gray

Cucurbitaria ailanthi Rabenh., Fung. Eur. :1833. 1874

Chorology: ESP.- Na (44), (125)
Substrate: *Acer monspessulanus*
Herbaria: MA-Fungi.

Cucurbitaria berberidis (Pers.:Fr.) Gray, Nat. Arr. Brit. Pl. 1:519. 1821
≡ *Sphaeria berberidis* Pers.:Fr., Syst. mycol. 2:415. 1823

Chorology: ESP.- B (118); Bu (118); Ma (70).
Substrate: *Abies pinsapo, Berberis hispanica* var. *garciae, Berberis vulgaris* var. *alpestris*

Cucurbitaria cytisi Mirza, Nova Hedwigia 16:192. 1968

Chorology: ESP. Ab (112); Gu (28); M (28). PRT. BA (15); Mi (29).
Substrate: *Cytisus pendulinus, Cytisus scoparius, Genista scorpius, Genistella tridentata, Retama sphaerocarpa, Ulex europaeus*
Herbaria: AH, "Herb. HJCh.-GM", LISE, MA-Fungi

Cucurbitaria elongata (Fr.:Fr.) Grev., Scot. crypt. Fl. 4:195.1826
≡ *Sphaeria elongata* Fr.:Fr., Syst. mycol. 2:422. 1823
= *Sphaeria coluteae* Rabenh., Herb. Mycol. :1239. 1849

Cucurbitaria coluteae (Rabenh.) Auersw., in Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24:174. 1870

Chorology: ESP.- M (11), (49), (50), (51), (53), (118), Ma (69); Mu (65); Na (44), (125). : Without locality, (7), (118).
Substrate: *Colutea arborescens, Retama sphaerocarpa, Robinia pseudacacia, Ononis tridentata, Ulex baeticus*
Herbaria: "Herb. JL", "Herb. MHG", MA-Fungi.

Observations : It was only possible to study the asexual form, which is fits with SIVANESAN (1984)

Cucurbitaria laburni (Pers.:Fr.) De Not., Exsicc. Herbar. Crittog. Ital. :875. 1862
≡ *Sphaeria laburni* Pers.:Fr, Syst. mycol. 2:413. 1823

Chorology: ESP. Hu (118), (123); M (32); Mu (68).
Substrate: *Ononis tridentata, Ononis tridentata* var. *intermedia, Retama sphaerocarpa*
Herbaria: "Herb. JCh-GM", "Herb. JL", "Herb. MHG"

Cucurbitaria obducens (Fr.:Fr.) Petrak, Ann. Mycol. 25:226. 1927
≡ *Sphaeria obducens* Fr.:Fr., Syst. mycol. 2:456. 1823
Teichospora obducens (Fr.:Fr.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24:161. 1870
Strickeria obducens (Fr.:Fr.) Kuntze, Rev. Gen. Pl. 3:533. 1898

Chorology: ESP. Cu (5); Hu (74); L (101); M (33), (114); Mu (65); Sg (30) ; Z (89).
Substrate: *Cistus laurifolius, Fraxinus angustifolia, Fraxinus excelsior, Quercus ilex* ssp *rotundifolia, Ulex* sp., dead decidous wood
Herbaria: AH, "Herb. DSL", "Herb. H.JCh-GM", "Herb. MHG"

Cucurbitaria rhamni (Nees:Fr.) Fr., Summ. veg. Scand. :391. 1849
≡ *Sphaeria rhamni* Ness.:Fr, Syst. mycol. 2:417. 1823

Chorology: ESP. M (31), (118), (124)
Substrate: *Gypsophila struthium, Rhamnus lycioides*
Herbaria: AH

Cucurbitaria spartii (Nees:Fr.) Ces. & De Not., Comment. Soc. Crittog. Ital. 1:214. 1836
≡*Sphaeria spartii* Nees:Fr., Syst. mycol. 2:424. 1823

Chorology: ESP.- Ab (68); Cu (119); Gu (31); M (31), (47), (118); Sg (31). PRT.- BL (82); E (22), (36), (37); R (15).
Substrate: *Adenocarpus complicatus, Cytisus scoparius, Cytisus* sp., *Genista florida, Genista* sp., *Pterospartium tridetatum,, Retama sphaerocarpa, Spartium junceum, Ulex* sp
Herbaria: AH, “Herb. JL”, LISE, MA-Fungi

Cucurbitaria varians Hazsl., Verh. Zool.-bot. Ges. Wien 15:451. 1865
= *Fenestella lycii* (Duby) Sacc., Syll. Fung., . 1883

Chorology: ESP.- Al (68); Se (45), (50), (118).
Substrate: *Lycium intricatum*
Herbaria: “Herb. JL”

DECAISNELLA Fabre, Ann. Sci. Nat., Bot., sér. 6, 9:112. 1879
Typus.- *Decaisnella spectabilis* Fabre

Decaisnella ephedrae (Fabre) Fabre, Ann. Sci. Nat., Bot., sér. 6, 9:. 1879
≡ *Pleospora ephedrae* Fabre, Ann. Sci. Nat., Bot., sér. 6, 15:214. 1883
Typus.- Ind. Loc. On *Ephedra helveticae*, from Vaucluse, France (WEHMEYER, 1961)

Chorology: ESP.- Hu (122), (118).
Substrate: *Ephedra vulgaris*
Herbaria: MA-Fungi

FENESTELLA Tul. & C.Tul., Sel. Fung. carp. 2:208. 1863
Typus.- *Fenestella princeps* Tul. & C.Tul.

Fenestella princeps Tul. & C.Tul., Sel. Fung. carp. 2:207. 1863

= *Fenestella fenestrata* (Berk. & Broome) J.Schröt., Krypt.-Fl- Schelesien 3:435. 1897
Chorology: ESP. L (42), (118); Na (125), (44); Sg (31).PRT. Mi (29).
Substrate: *Crataegus monogyna, Lonicera pyrenaica, Pistacia terebinthus, Quercus robur.*
Herbaria : AH, “Herb. HJCh.-GM.”

HEPTAMERIA Rehm & Thüm., Inst. Rev. Sci. Lett 27 :252. 1879
Typus.- *Heptameria obesa* (Durieu & Mont.) Sacc.

Heptameria obesa (Durieu & Mont.) Sacc., Syll. Fung. 2 :88. 1883
≡ *Sphaeria obesa* Durieu & Mont., Flore d'Algerie :526
= *Heptameria elegans* Rehm & Thüm., in Thümen, Instituto (Coimbra), Sér. 2 27(6):252.1879
Typus.- Ind. Loc. Portugal (Beira Litoral) Munda, Coimbra on dead wood unidentified, Mesnier
= *Heptameria helichrysi* (Fabre) Sacc., Syll. Fung. 2 :89. 1883
= *Leptosphaeria thuemeniana* Niessl, in Thümen, Instituto (Coimbra), Sér. 2 28(8) :364. 1881
Typus.- Ind. Loc. Portugal (Beira Litoral) Baleia, Coimbra, stems of *Anthirrinum major*, Moller.

Heptameria thuemeniana (Niessl) Sacc., Syll. Fung. 2 :89.1883

Chorology: ESP.- B (101); M (46), (118). PRT.- BL (102), (118); E (19),.Without locality (103)
Substrate: *Antirrhinum major, Centaurea sempervirens, Inula viscosa Scabiosa columbaria* var. *carpetana, branches unidentified.*
Herbaria : LISE

LEWIA M.E.Barr & E.G.Simmons, Mycotaxon 25(1) :289. 1986
Typus.- *Lewia scrophulariae* (Desm.) M.E.Barr & E.G.Simmons

Lewia infectoria (Fuckel) M.E.Barr & E.G.Simmons, Mycotaxon 25(1):296. 1986
≡ *Pleospora infectoria* Fuckel, Symb. mycol. :132. 1870
Typus.- In K. (lectotype), Fuckel, Fungi Rhenani 2246 "Ad *Secalis, Hordei* et *Tritici vulg.* culmos aridos, frequens. Vere" (EGS 37-160) (.SIMMONS, 1986).

= *Pleospora excelsa* Gonz.Frag., Bol. Soc. Esp. Hist. Nat. 23:328. 1923
Typus.- In MA-Fungi 6141 (MA-FUNHIST). Spain, Madrid, Real Jardín Botánico, leaves of *Chamaerops excelsa.*
= *Pleospora microspora* Niessl, Verh. Naturf. Vereins Brünn 14:181. 1876
Chorology: ESP.- O (115), (118); B (54), (101), (118); Ba (121), Cu (119); Lo (117); M (11), (46), (49), (50), (57), (58), (118); Mu (68); Na (44), (125), (77); Se (50), (118). PRT. BL (2), (12), (118), (130), (131). Without locality(103).

Substrate: *Agrostis hispanica, Astrocarpus subfruticans, Brachypodium pinnatum, Brachypodium* sp.,*Centranthus ruber, Chamaerops excelsa, Dactylis glomerata, Dactylis glomerata* var. *hispanica, Eryngium campestre, Moricandia arvensis, Phleum pratense* var. *nodosum, Phragmites communis, Piptatherum multiflorum, Ranunculus minae, Rapistrum rugosum, Scleropoa rigida, Trifolium angustifolium, Trifolium pratense, Triticum vulgare, Zea mays*, unidentified stem.

Herbaria: COI, "Herb.JL", MA-Fungi.

Lewia scrophulariae (Desm.) M.E.Barr & E.G.Simmons, Mycotaxon 25(1):294. 1986

≡ *Sphaeria scrophulariae* Desm., Ann. Sci. Nat., Bot., sér. 2, 6:245. 1836 lectotype in (FH), exsicc. cit.,718 "Au printemps, sur les capsules dessèchès de la *Scrophulaire aquatique*." (EGS 38-123).(SIMMONS, 1986)

Pleospora scrophulariae (Desm.) Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturiwss. Cl., Abt. 1(126):374. 1917

= *Pleospora asphodeli* Rabenh., Un. Ital. Crypt.,n§: 12. 1866
= *Pleospora herbarum* f. *microspora* Sacc., Syll. Fung. 2:247. 1883
= *Pleospora maireana* Lamb. & Fautrey, Rev. Mycol. (Tolouse) :142. 1897
= *Pleospora syringae* Fuckel, Symb. mycol. :130. 1870
= *Pleospora varians* Ces., Hedwigia 21:9. 1882
= *Pleospora vulgaris* Niessl, Verh. Naturf. Vereins Brünn 14:187. 1876

Pleospora vulgaris var. *monosticha* Niessl, Verh. Naturf. Vereins Brünn 14:187. 1876

Pleospora vulgaris var. *disticha* Niessl, Verh. Naturf. Vereins Brünn 14:187. 1876

Chorology: ESP. Ab (112), (118); O (106); B (54), (59), (118); Ca (50), (62), (118); Cc (4), (5); CR (117); Cu (119); Ge (54), (101), (118); Gr (60), (118); M (11), (46), (48), (49), (50), (51), (53), (118);.Ma (55), (118); Mll (67), (96); Mu (43), (65); Na (44), (77), (125); S (49), (50), (118); Se (45), (50), (118); Te (118); Z (118). PRT.- Ag (81), (118); Bal (81); BL (91), (99), (118), (132), (133); DL (25); E (17), (38), (79), (81); Mi (56); R (1), (15), (16), (38). Without locality (103), (118).

Substrate: *Andryala integrifolia, Anthyllis cytisoides, Arabis hirsuta, Armeria stenophylla, Asphodellus albus Asphodelus fistulosus, Asphodelus ramosus, Bupleurum fruticosum, Bupleurum junceum, Centaurea calcitrapa, Centaurea lusitanica, Centaurea sempervirens,* *Centaurea sphaerocephala, Cirsium lanceolatum, Cirsium odontolepis, Cistus laurifolius, Cnorum tricoccum, Convolvulus arvensis Cytisus purgans, Cytisus scoparius, Daphne gnidium, Dianthus lusitanicus, Digitalis obscura, Dipsacus sylvestris Doronicum carpetanum, Eruca vesicaria, Eryngium bourgatii, Eryngium campestre, Eryngium maritimum, Eryngium pandanifolium, Foeniculum vulgare, Hieracium carpetanum, Iberis corifolia, Inula viscosa, Kentrophyllum lanatum, Kochia prostata, Lavandula vera, Linaria caesia, Linaria nivea, Lithodora diffusa* ssp. *lusitanica, Marrubium vulgare, Mathiola tristis, Microlonchus clusii Microlonchus salmanticus, Myoporus acuminatus, Onopordon acanthium, Phlomis purpurea, Phormium tenax, Plantago maritima, Ranunculus minae, Retama sphaerocarpa, Rubus fruticosus Salvia verbenaca, Scabiosa maritima, Scolymus maculatus, Scorzonera graminifolia, Senecio tournefortii* var. *carpetanum, Sideritis incana* var. *glabrata, Silene nutans, Sisymbrium* sp, *Solanum dulcamara, Sonchus tenerrimus, Syringa vulgaris, Teucrium fruticans Thesium divaricatum, Verbascum pulverulentum, Vinca media, Viola sylvatica*

Herbaria: COI, LISE, MA-Fungi, "Herb. EGA", "Herb. MHG"

MACROSPORA Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24:139. 1870

Typus.- *Macrospora scirpicola* (DC.:Fr.) Fuckel

Macrospora scirpicola (DC.:Fr.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 25,26:301. 1871

≡*Sphaeria scirpicola* DC.:Fr., Syst. mycol. 2:510. 1823

Typus.- Ind. Loc. Neuchatel, Chaillet in hb. Hall Aestate, G. (SHOEMAKER & BABCOCK, 1992)

Pleospora scirpicola (DC.) P.Karst., Mycol. Fenn. 2:72. 1871

Chorology: PRT. E (85).

Substrate: *Cyperus longus*

Macrospora typhicola (Cooke) Shoemaker & C.E.Babc., Canad. J. Bot. 70:1644. 1992

≡ *Sphaeria typhicola* Cooke, Grevillea 5:121. 1876

Typus.- In K. North Ructon, Jan. 1873, *Typha angustifolia* (WEHMEYER, 1961)

Pleospora typhicola (Cooke) Sacc., Syll. Fung. 2:264. 1883

Chorology: PRT. E (36).
Substrate: *Typha angustifolia*
Herbaria: LISE

MONTAGNULA Berl., Icon. Fung. 2 :68. 1896
Typus.- *Montagnula infernalis* (Niessl) Berl.

Montagnula camarae (M.T.Lucas) Checa, nov. comb.
≡ *Pleospora camarae* M.T.Lucas, Mem. Soc. Brot. 21:38. 1971
Typus.- In LISE 2276. Portugal, Algarve, Serra de Monchique, *Sarothamnus scoparius*

Chorology : PRT.- Ag (39), (81).
Substrate : *Sarothamnus scoparius*
Herbaria : LISE

Montagnula gilletiana (Sacc.) Crivellli, Diss ETH, Zürich, n. 7318:163. 1983
≡ *Pleospora gilletiana* Sacc., Michelia 1:357. 1880
= *Pleospora gilletiana* f. *ulicis* Sacc., Michelia 2:69. 1880

Chorology: ESP-. Ab (112), (118); B (52), (118); M (11), (60), (118). PRT.- Ag (39), (81).
Substrate: *Retama sphaerocarpa, Ulex europaeus, Ulex parviflorus*
Herbaria: MA-Fungi

Montagnula infernalis (Niessl) Berl., Icon. Fung. 2:69. 1896
≡ *Leptosphaeria infernalis* Niessl, Instituto (Coimbra), Sér. 2, 31(2):89. 1883
Typus in PRT (COI) (N. 650, IV serie) "Ad folia emortua *Fourcroyae longaeve*. Circa da S.Bento, pr. Coimbra. 2-81. Leg. Moller"
= *Pleospora pustula* Berl. & F.Sacc., Rev. Mycol. (Tolouse) :83. 1889

Chorology: PRT. BL (9), (91), (118); E (15).Without locality(103)
Substrate: *Agave americana, Fourcroya gigantea, Fourcroya longeva*
Herbaria: COI, LISE

Montagnula phragmospora (Dur. & Mont.) Crivelli, "Diss." ETH, Zürich, n. 7318:155. 1983
≡ *Sphaeria phragmospora* Durieu & Mont., Flore d'Algerie :520. 1856
Typus.- In PC (ex Montagne Herb.). Algeria, *Agave* (WEHMEYER, 1961)

= *Pleospora agaves* De Not., Sfer. Ital., Accad. Sc. Torino :63. 1863
= *Pleospora ovoidea* Niessl, Instituto (Coimbra), Sér. 2, 31(2):88. 1883
Typus.- Ind. Loc. Portugal, Beira Litoral, Coimbra, leaves of *Agave americana.*

Chorology: ESP.- Se (50), (118).PRT.- Aal (13); BL (2), (8), (12), (91), (98), (118); E (1), (12), (80), (103).
Substrate: *Agave americana, Agave hookeri, Agave* sp ,*Yucca* sp.,
Herbaria: LISE, MA-Fungi

Montagnula spinosella (Rehm) Crivelli, "Diss." ETH, Zürich, n. 7318:160. 1983
≡ *Pleospora spinosella* Rehm, Ber. Naturhist. Vereins Augsburg: 26. 1881
Typus.- In S (Rehm Asc. 440). Tyrol, Pizthal, *Juncus hostii*, Aug. 1875. (WEHMEYER, 1961).

Chorology: ESP.- M (118)
Substrate: *Abelia triflora*
Herbaria: MA-Fungi

MYCOGLAENA Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturiwss. Cl., Abt. 1(118):1210. 1909
Typus.- *Mycoglaena subcoerulescens* (Nyl.) Höhn.
= *Sampaioa* Gonz.Frag., Bol. Soc. Brot., Sér.2, 2:32. 1923
Typus.-*Sampaioa pinastri* Gonz.Frag.

Mycoglaena acuminans (Nyl.) Vainio, Acta Soc. Fauna Fl. Fenn 49(2):165. 1921
≡ *Verrucaria acuminans* Nyl., Sert. Lich.Trop.: 45. 1891

= *Sampaioa pinastri* Gonz.Frag., Bol. Soc. Brot., Sér.2, 2:32. 1923
Typus.-In MA-Fungi (MA-FUNHIST 18532). Portugal, Povoa de Lanhoso; S.Gens, in cortice ramulorum *Pini pinastri*, IX-1919, leg. Prof. Dr. G. Sampaio.

Chorology: PRT.- Mi (56), (118).
Substrate: *Pinus pinaster*
Herbaria: MA-Fungi

MYCOTHYRIDIUM Petrak, Sydowia 15:188. 1962

Mycothyridium lividum (Pers.:Fr.) Petrak, Sydowia 15 :188 .1962.

≡ *Sphaeria livida* Pers.:Fr., Syst. mycol. 2 : 480. 1823
Thyridium lividum (Pers.:Fr.) Sacc., Michelia 1 :50. 1877

= *Fenestella lyciella* Gonz.Frag., Asoc. Esp. Progr. Ci. Congr. Coimbra (Ci. Nat.) 6:9. 1925

Chorology: ESP.- A (20), (83); Me (31), Mll (88); Mu (64), (65), Se (50), (118) PRT. Ag (61), (118); E (16), (17).
Substrate: *Castanea sativa, Hedera helix, Lycium intricatum, Olea europea, Pinus halepensis*, *Zea mays*, dead wood unidentified.
Herbaria:AH, MA-Fungi, "Herb. MHG"

PLEOSPORA Rabenh. ex Ces. & De Not., Comment. Soc. Crittog. Ital. 1:217. 1863
Typus.- *Pleospora herbarum* (Pers. :Fr.) Rabenh.

Pleospora abscondita Sacc. & Roum., Rev. Mycol. (Tolouse) :46. 1881
Typus.- In PAD. Pl. abscondita socia *Hendersonia cristophiala* sur *Arundo phragmites*.

Chorology: ESP.- Mu (66).
Substrate: *Phragmites communis*

Pleospora anthyllidis Auerw. & Niessl, Verh. Naturf. Vereins Brünn 14:190. 1876
Typus.- In M (ex Niessl Herb.) (Syntype). Spain, Pena de Oroel, *Anthyllis montana,* June 1850, Willkom (WEHMEYER, 1961).

Chorology: ESP.- Hu (118); Lo (115), (118); O (104), (118).
Substrate: *Anthyllis montana, Anthyllis vulneraria*
Herbaria: MA-Fungi

Pleospora brachyspora (Niessl) Petrak, Ann. Naturh. Museum Wien 50:445. 1939

≡ *Pleospora phaeospora* var. *brachyspora* Niessl, Verh. Naturf. Vereins Brünn 14:195. 1876
= *Pleospora dianthi* (De Not.) Berl., Icon. Fung. 2:42. 1900
= *Pyrenophora notarisii* Sacc., Syll. Fung. 2:285. 1883

Chorology: ESP.- Av (5); L (63), (101), (118); M (46), (53), (118); O (104), (109), (118), Se (50), (118). PRT.- BL (8), (118), (130), (131); E (118). Without locality(103).
Substrate: *Dianthus brachyanthus, Dianthus broterii, Dianthus caryophyllus, Dianthus lusitanicus, Dianthus monspessulanus, Dianthus* sp
Herbaria: MA-Fungi

Pleospora comata Auersw. & Niessl, Verh. Naturf. Vereins Brünn 10:180. 1871
Typus.- In FH (Rab. Fung. eur. 1544). Prope Brünn, *Pulsatilla*, Niessl
= *Pyrenophora comata* (Auersw. & Niessl) Sacc., Syll. Fung. 2:286. 1883

= *Pleospora centaurea-ornatae* Unamuno, Asoc. Portug. Progres. Ci. Congr. Porto 5:358. 1943
Typus.- In MA-Fungi 11983, Spain, Ciudad Real, Santa Elena, Lagunas de Ruidera, stems of *Centaurea ornata*.

Chorology: ESP.- CR (120); Ge (63), (42), (101), (118); M (118).
Substrate: *Carlina corymbosa, Centaurea ornata, Doronicum carpetanum, Lychnis alpina, Urtica dioica*
Herbaria: MA-Fungi

? Pleospora cytisi Fuckel, Symb. mycol. :132. 1870
Typus.- In FH (Isotype). Eberbach, Vere (Fung. rehn. 2316), *Cytisus saggitalis* (WEHMEYER, 1961)

Chorology: ESP.- B (118).
Substrate: *Spartium junceum*

Pleospora dichromatricha (Speg.) Wehm., Mycologia 45:401. 1953
≡ *Pyrenophora dichromatricha* Speg., Anal. Mus. Nac. Buenos Aires 26:126. 1914
In LPS, Universidad Nacional de la Plata. Museo-Instituto Spegazzini. N.2199. Las Palmas (España, Islas Canarias), Puerto de la Luz, Leg. C. Spegazzini, XII-1913

Chorology: ESP (Al) PRT.- Ag (39), (81).
Substrate : *Centaurea paniculata, Euphorbia nicaeensis, Nepeta tuberosa, Pallenis spinosa, Scabiosa maritima,* stems unidentified.
Herbaria: AH, LISE

Pleospora helvetica Niessl, Verh. Naturf. Vereins Brünn 14:191. 1876

Typus.- In M (lectotype). Wenediger, Stur,*Artemisia spicata* Wulfen (CRIVELLI, 1983)

= *Pleospora chrysospora* Niessl, Hedwigia 9:173. 1880
Pyrenophora chrysospora (Niessl) Sacc., Syll. Fung. 2:285. 1883

Chorology: ESP.- Gr (60), (118); Hu (42), (118), (122); L (59), (118); M (53), (118); Se (50), (118).
Substrate: *Aster alpinus*, *Astragalus nevadensis*, *Centaurea calcitrapa, Digitalis lutea, Ononis spinosa, Santolina chamaecyparissus, Solanum dulcamara, Veronica fruticulosa*
Herbaria: MA-Fungi

Pleospora herbarum (Pers.:Fr.) Rabenh., Herb. Mycol. II:547. 1854
≡ *Sphaeria herbarum* Pers.:Fr., Syst. mycol. 2:511. 1823

= *Pleospora herbarum* f. *ailanthi* Niessl, Instituto (Coimbra), Sér. 2, 31(2):88. 1883
= *Sphaeria armeriae* Corda, Icon. Fung. 4:41. 1840
Pleospora herbarum f. *armeriae* (Corda) Sacc., Syll. Fung.: 2.247. 1883

= *Pleospora herbarum* f. *citrorum* Sacc., Michelia 2:417. 1882
= *Pleospora herbarum* var. *coluteicola* Henn., Verh. Bot. Vereins Prov. Brandenburg 47:11. 1905
= *Pleospora herbarum* f. *lagenariae* Niessl, Instituto (Coimbra), Sér. 2, 31(2):88. 1883
= *Pleospora herbarum* f. *lilii*
= *Pleospora herbarum* var. *minor* Niessl, in Thümen, Instituto (Coimbra), Sér. 2, 28(8):365. 1881
= *Pleospora herbarum* var. *robusta* Niessl, in Thümen, Instituto (Coimbra), Sér. 2, 28(8):365. 1881
= *Pleospora herbarum* var. *rutae* Henn., Hedwigia 42:218. 1903
= *Pleospora herbarum* f. *siliquaria* Kunze, in Sacc., Syll. Fung. 2:247. 1883
= *Sphaeria allii* Rabenh., Herb. Mycol. 1:838. 1838
Pleospora allii (Rabenh.) Ces. & De Not., Comment. Soc. Crittog. Ital. 1:218. 1861

= *Pleospora asparagi* Rabenh., Herb. Mycol. 2:750
= *Pleospora evonymi* Fuckel, Symb. mycol. :133. 1870
= *Didymosphaeria halymi* Gonz.Frag., Asoc. Esp. Progr. Ci. Congr. Coimbra (Ci. Nat.) 6:10. 1925

Type in PO (holotype). Portugal, Algarve, Praia da Rocha, on *Atriplex halymum* (Chenopodiaceae) G. Samapaio IV-1925, 1236 F (APTROOT, 1995).

= *Pleospora petiolorum* Fuckel, Symb. mycol.: 132. 1870
= *Pleospora principis* Pass., Micr. Ital.,n§: 6. 1880
= *Pleospora salsolae* Fuckel, Symb. mycol. :131. 1870
= *Sphaeria subriparia* Cooke, Grevillea 5:121. 1876
Pleospora subriparia (Cooke) Sacc., Syll. Fung. 2:278. 1883

Chorology: ESP.- Ab (112), (116), (118); B (52), (54), (101), (76), (118), (127); Bi (3); Bu (118); C (118); Cc (4); Cs (59), (62), (118); CR (117); Cu (4); Ge (72), (75), (101); Gr (45), (118); Gu (31) ; H (111), (118); Hu (74), (118), (122); M (4), (11), (46), (48), (49), (50), (60), (53), (57), (118), (123), (127); Ma (118); Mll (67), (96); Mn (54), (118), Mu (43), (65), (118); Na (44), (77), (125); (O) (104), (105), (106), (109), (110), (118); Po (73); S (118); Sa (6); Se (45), (50), (92), (118); Sg (31) ; T (54), (90), (101), (118), (129); Te (62), (78), (118); To (62), (118); V (118), (128); Vi (118); Z (118), (127); Za (74), (118); Without locality (41), (71). PRT.- Ag (39), (61), (81), (118); Aal (18), (81); Bal (18), (81); BL (2), (8), (12), (18), (91), (98), (99), (102), (118), (130), (131), (132), (133); DL (56), (118); E (1), (2), (13), (14), (18), (23), (24), (39), (81), (95), (100), (118); Mi (20), (29), (56), (118); R (1), (100); TM (118), (132), (133). Without locality (9), (94), (97), (103).

Substrate: *Acacia saligna, Allium cepa, Ailanthus glandulosa, Allium ceparatum, Allium* sp., *Aloe* sp., *Althaea cannabina, Ammophila arenaria, Andryala ragusina, Angelica sylvestris, Anthemis arvensis, Anthemis hortensis, Aquilegia dichroa, Arabis hirsuta, Armeria plantaginea, Armeria pyrenaica* var. *leucantha, Arundo donax ,Aster acris, Aster spinosus, Asparagus officinalis, Asphodelus microcarpus, Asphodelus* sp, *Astragalus chlorocyanus, Atriplex halymum, Brassicaa cheirantus, Brassica oxyrrhina, Bupleurum fruticosum, Bupleurum junceum, Buxus sempervirens, Cacalia suaveolens, Callistemon phoenicens, Campanula rapunculus, Capsicum frutescens, Carlina corymbosa, Carlina hispanica, Cassia* sp., *Centaurea alba* var. *deusta, Centaurea pina, Centaurea calcitrapa, Centaurea scabiosa, Centranthus calcitrapa, Centranthus longicalcaratus, Cephalaria tatarica, Cephalaria leucantha, Cerastium pumilum, Cichorium endivia, Cichorium intybus, Cineraria maritima, Cistus ladaniferus, Cistus*

laurifolius, Citrus limon Colutea arborescens, Crucianella angustifolia, Cichorium intybus, Clematis sp, *Conium maculatum, Cucurbita maxima, Cynara scolymus, Cynoglossum creticum, Cyperus capitatus, Cytisus scoparius, Dactylis glomerata, Daucus carota, Datura stramonium, Delphinium staphisagria, Dianthus broterii, Dianthus caryophyllus, Digitalis thapsi, Digitalis nevadensis, Digitalis purpurea, Diotis maritima, Dipsacus silvestris, Echium vulgare, Ephedra* sp , *Erucastrum incanum, Eryngium bourgati, Eryngium campestre, Eryngium maritimum, Erythrinum poianthum, Euphorbia sarracina, Euphorbia paralia,s Euphorbia terracina, Evonymus europaeus, Ferula communis, Ficus rubiginosus, Foeniculum officinale, Genista falcata, Gladiolus* sp, *Glaucium flavum, Glycine violacea, Glycyrrhiza glabra, Gomphocarpus fruticosus, Gymnocladus canadensis, Hedera helix, Helenium autumnale, Helianthemum pulverulentum, Helichrysum angustifolium, Hibiscus roseus, Hieracium laniferum, Hippocrepis glauca, Hirschfeldia adpressa, Hypericum perforatum, Inula viscosa, Iris sisyrinchium, Jasione montana, Jasminum officinale, Juncus maritimus, Juniperus oxicedrus, Kennedya ovata, Kentrophyllum lanatus, Lagenaria vulgaris Lapsana communis, Laserpitium scabrum, Laurus nobilis, Lavandula angustifolia, Lavandula stoechas, Lavandula vera, Lepidium graminifolium, Lonicera chinensis, Lotus creticus, Malva* sp, *Mathiola incana, Marrubium vulgare, Medicago littoralis Medicago lupulina, Melandrium macrocarpum, Melilotus alba, Microlonchus clusii, Muehlenbeckia sp., Nepeta tuberosa, Odontospermum maritimum, Oenanthes phollandrii Olea europea, Ononis campestris, Onopordon acanthyum, Pallenis spinosa, Pancratium maritimum, Passiflora coerulea, Peucedanum lancifolium, Phoenix dactylifera, Phyteuma spicatum, Phytolacca decandra, Picris longifolia Pisum sativum, Plagium ageratifolium, Plantago lanceolata, Plantago* sp., *Populus* sp *Pterospartium tridentatus, Pycnomon rutaefolium, Raphanus sativus, Reseda alba, Reseda lutea, Reseda virgata, Retama sphaerocarpa, Ricinus communis, , Robinia pseudacacia, Rosa canina, Ruta angustifolia, Ruta bracteosa, Sagina apelata, Salix babilonica, Salsola vermiculata, Santolina rosmarinifolia, Saponaria officinalis, Sarothamnus scoparius, Scabiosa atropurpurea, Scabiosa columbaria, Scabiosa maritima, Scirpus holoschoenus, Scorzonera graminifolia, Scrophularia scorodonia, Senecio scandens, Serratula nudicaule, Seseli cantabricum, Sideritis incana* var. *glabra, Silene nutans, Sinapis hispida, Sison amosum,*

Silene inflata, Smyrnium olusatrum, Solanum dulcamara, Solanum nigrum, Solidago virga-aurea var. *cambrica, Sonchus tenerrimus, Sorghum alpense, Spartium junceum, Stellaria holostea, Sylibum marianum, Sysimbrium contortum, Tamus communis, Thapsia villosa, Thymus camphoratus, Torula hariotiana, Trifolium angustifolium, Ulex europeus, Urtica dioica, Verbascum sinuatum, Vitis vinifiera, Xanthium spinosum, Yucca filamentosa, Zollikoferia resedaefolia.* Paper, dung of hare.

Herbaria: COI, "Herb. EGA", "Herb. FMR", "Herb. HJCh.-GM", "Herb. MHG", LISE, LISFA, MA-Fungi.

Pleospora herbarum var. **occidentalis** Wehm., Lloydia 15:86. 1952

Typus.- In DAOM (Wehmeyer, 1055), U.S.A., Hoback Canyon, Wyo., Jackson, June 1940, on *Sphaeralcea rivularis* (WEHMEYER, 1961)

= *Pleospora herbarum* f. *nepetae* Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 4:22. 1914

Typus.- In MA-Fungi 1382, Spain, Madrid, Navacerrada, Estación Alpina de Biología, on stems of *Nepeta nepetella*

Chorology: ESP.- M (46), (118). PRT.- E (26).
Substrate: *Nepeta nepetella, Nepeta tuberosa*
Herbaria: MA-Fungi

Pleospora lactucicola Ellis & Everh., J. Mycol. 4:64. 1888

Typus.- In NY (Ellis Collection 297). U.S.A.,Newfield, N.J., *Lactuca*, June 1878

Chorology: PRT.- Bal (39), (81).
Substrate: *Mentha rotundifolia,* unidentified stems.
Herbaria: LISE

Pleospora orbicularis Auersw., Hedwigia, 7:184 and Österr. Bot. Z. 9:274. 1868

= *Pleospora coluteicola* Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 12:15. 1917

Typus.- In MA-Fungi 2178. Spain, Madrid, Real Jardín Botánico, on branches of *Colutea tragacanthoides.*

= *Pleospora herbarum* f. *halimodendri* Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 12:18. 1917

Typus.- In MA-Fungi 2101. Spain, Madrid, Royal Botanical Garden, on branches of *Halimodendrum argenteum*, A. Caballero. 14-VIII-1916

Chorology: ESP.- Ab (118); B (118); Cu (118), L (118); M (11), (51), (118); Ma (118); Se (118); Z (118). PRT.- E (17).
Substrate: *Chondrilla juncea, Colutea tragacanthoides, Digitalis obscura, Ephedra distachya, Foeniculum vulgare, Halimodendrum argenteum, Inula montana, Lapsana communis, Mathiola tristis Microlonchus clusii, Rhododendron ponticum, Saponaria officinalis, Sexeli peixotiani, Thesium divaricatum,*
Herbaria: LISE, MA-Fungi

Pleospora paronychiae Cooke, Grevillea 12:38. 1883
Typus.- In K. France, on *Paronychia serpylifolia.* (WEHMEYER, 1961)

Chorology: ESP.- B (93), (118); Na (44), (77), (125).
Substrate: *Paronychia argentea, Paronychia nivea*
Herbaria: MA-Fungi

Pleospora pellita (Fr.:Fr.) Rabenh., Herb. Mycol. 2: 749. 1858
≡ *Sphaeria pellita* Fr.:Fr., Syst. mycol. 2:503. 1823

Chorology: ESP.- H (122).
Substrate: *Santolina chamaecyparissus*
Herbaria: MA-Fungi

Pleospora penicillus var. **ambigua** (Berl. & Bres.) Crivelli, "Diss." ETH Nr. 7318:75. 1983
≡ *Pyrenophora ambigua* Berl. & Bres., Ann. Soc. alp. trident. 14:44. 1899
= *Pleospora smyrnii* Gonz.Frag., Asoc. Esp. Progr. Ci. Congr. Coimbra (Ci. Nat.) 6:14. 1925
Typus.- In MA-Fungi 17721. Portugal, Estremadura, Cezimbra, on stems of *Smyrnium olusatrum*

Chorology: ESP.- Cs (59), (118); M (118); Z (118). PRT.- Ag (39), (81), (118); E (83), (107), (118).
Substrate: *Lavandula stoechas, Pycnomon rutaefolium, Robinia pseudacacia, Ruta chalepensis, Santolina rosmarinifolia, Silene otitis, Smyrnium olusatrum, Verbascum boerhaveri*
Herbaria: LISE, MA-Fungi
Pleospora penicillus Wehm. var. **penicillus,** A World monograph of the genus Pleospora and its segregates :185. 1961
Typus.- In FH (Fuckel Herb. n. 456) (CRIVELLI, 1983).

= *Pleospora herbarum* f. *solidaginis* Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 4:22. 1914
Typus.- In MA-Fungi 1380. Spain, Madrid, Cercedilla, on stems of *Solidago virga-aurea* var. *cambrica*

= *Pleospora heterophragmia* Sousa da Câmara, Agron. Lusit. 13(2):128. 1951
Typus.- In LISE 32072. Portugal, Ribatejo, Tomar (Quinta dos Sete Montes), on branches of *Lonicera* sp., García Cabral, VIII-1950

= *Pleospora vitis* Catt., Arch. Lab. Bot. Crittog. Univ. Pavia 2(3):257. 1879

= *Sphaeria phaeocomes* Berk. & Broome, Ann. Hist.-Nat. Mus. Natl. Hung. 6:355. 1841
Pyrenophora phaeocomoides (Berk. & Broome) Sacc., Syll. Fung. 2:280. 1883
Chorology: ESP.- Hu (118), (122); M (11), (46), (48), (49), (50), (53), (118); Se (49), (50), (118). PRT -Ag (81); Aal (25); E (24), (26), (83); R (21).
Substrate: *Bupleurum rigidum, Centaurea salamantica, Digitalis thapsi, Hypochaeris radicata, Lavandula stoechas, Lavandula vera, Lonicera hispanica, Lonicera* sp , *Reseda virgata, Rhododendron ponticum, Solidago virga-aurea* var. *cambrica*, *Vitis* sp
Herbaria: LISE, MA-Fungi

Observations : The type collection of *Pl. herbarum* f. *solidaginis* Gonz.Frag. was revised by L.E. Wehmeyer and he determined it as *Pl. penicillus* var. *penicillus.*

Pleospora phaeospora (Duby) Ces. & De Not., Comment. Soc. Crittog. Ital. 1:218. 1863
≡ *Sphaeria phaeospora* Duby, in Rabenh., Herb. Mycol. 2: 1934
Typus.- In FH (isotype). Montis Cenisii, on *Sempervivum* (WEHMEYER, 1961).

= *Pyrenophora saponariae* Gonz.Frag., Mem. Real Soc. Esp. Hist. Nat. 11:95. 1919
Typus.- In MA-Fungi 2920. Spain, Lérida, Montsech d´Ares, on *Saponaria caespitosa*

Chorology: ESP.- Hu (54), (118); L (54), (101), (118).
Substrate: *Saponaria caespitosa*
Herbaria: MA-Fungi

Pleospora pyrenaica Niessl, Verh. Naturf. Vereins Brünn 14:183. 1876
Typus.- in M (ex Niessl Herb.) (lectotype), Hochmoll bei Liezen, on *Draba aizoides* (WEHMEYER, 1961).

Chorology: ESP.- Cu (119).
Substrate: *Draba dedeana* var. *zapateri*
Herbaria: MA-Fungi

Pleospora tragacanthae Rabenh., Hedwigia 16:118. 1877
Typus.- In S (isotype). Monte Cenis, *Astragalus tragacanthus*, July 1876 (WEHMEYER, 1961).

Chorology: ESP.- Cu (128).
Substrate: *Astragalus chlorocyanus*
Herbaria: MA-Fungi

PYRENOPHORA Fr., Summ. veg. Scand. 2:397. 1849
Typus.- *Pyrenophora phaeocomes* Fuckel

Pyrenophora trichostoma (Fr.:Fr.) Fuckel, Symb. mycol. :215. 1870
≡ *Sphaeria trichostoma* Fr. :Fr., Syst. Mycol. 2 :215. 1823
Pleospora trichostoma (Fr.:Fr.) Ces. & De Not., Comment. Soc. Crittog. Ital. 1:217. 1863

Chorology: ESP.- M (46), (118). PRT.- BL (37), (118), (130), (131). Without locality (103).
Substrate: *Dactylis glomerata, Festuca nigricans, Secale cereale*
Herbaria: LISE, MA-Fungi

STRICKERIA Körber, Parerg. lich. :400. 1865
Typus.- *Strickeria kochii* Körber

Strickeria pruniformis (Nyl.) Kuntze, Rev. Gen. Pl. 3:534. 1898
≡ *Sphaeria pruniformis* Nyl., Flora 1863:322. 1863
Teichospora pruniformis (Nyl.) P.Karst., Mycol. Fenn. 2:66. 1873

Chorology: ESP.- Mu (65).
Substrate: *Prunus dulcis*

Herbaria: “Herb. MHG”

Observations : This material is cited as *Teichospora chevalieri* P.Karst., but the description is closer to *S. pruniformis* (Nyl.) Kuntze

TEICHOSPORA Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24:169. 1870
Typus.- *Teichospora trabicola* Fuckel

Teichospora clavispora Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46:330. 1894
Typus.- In NY (holotype). U.S.A., Kansas, Rooks Co., on *Negundo aceroides* (=*Acer negundo*), 14-Jul. 1894, E. Bartholomew, Kansasn F. 1509 (BARR, 1990 a).
Chorology: ESP.- Sg (30).
Substrate: *Thymus vulgare*
Herbaria: AH

Teichospora congesta (Cooke & Ellis) M.E.Barr, Mem. New York Bot. Gar. 62:31. 1990
≡ *Cucurbitaria congesta* Cooke & Ellis, Grevillea 6:12. 1877
Typus.- In NY (holotype of *T. tuberculata* (Ellis & Everh.) Kuntze). U.S.A., Kansas, on *Liriodendron tulipifera*, Morgan 1004, (BARR, 1990a).

Chorology: ESP.- M (31).
Substrate: *Crataegus monogyna*
Herbaria: AH

Teichospora hispida Fuckel, Jahrb. Nassauischen Vereins Naturk. 25-26:305. 1871
Typus.- In FH (isotype). Germany, Nassau, Bei Hattenheim, on *Prunus domestica*, spring, L. Fuckel, Herb. B.-B. 531 (BARR, 1990 a).

Chorology: PRT.- TM (56), (118).
Substrate: *Eucalyptus globulus, Robinia pseudoacacia*
Herbaria: MA-Fungi

Teichospora quercina (Ellis & Everh.) M.E.Barr, Mem. New York Bot. Gar. 62:34. 1990
≡ *Cucurbitaria quercina* Ellis & Everh., Bull. Torrey Bot. Club 24:460. 1897
Typus.- In NY (holotype). U.S.A., Pueblo Co., Greenhorn, on *Quercus undulata*, July 1897, E. Bethel 337 (BARR, 1990 a).

Chorology: ESP.- B (93), (118); Hu (126).
Substrate: *Betula verrucosa, Quercus lusitanica* var. *faginea*
Herbaria: MA-Fungi

Teichospora trabicola Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24:161. 1870
Typus.- In FH and NY (isotypes). Germany, Nassau, on *Quercus* sp., gravepine support, winter, G.Fuckel, Herb. B.-B. 532. (BARR, 1990 a).

Chorology: ESP.- Sg (30). PRT.- TM (118).
Substrate: *Castanea vulgaris, Cistus albidus*
Herbaria: AH

DOUBTFUL AND EXCLUDED TAXA

?= doubtful taxa
#= excluded taxa

I consider "doubtful taxa" when the description is not good enaough or the material is missing and "excluded taxa" when the material has been studied and the identification is uncertain.

? **Cucurbitaria asparagi** Sousa da Câmara & A.T.Vasconc., Agron Lusit. 14(4) :252. 1952
Typus.- Portugal, Ribatejo, Póvoa de Santa Iria, on stems of *Asparagus albus*, M. da Silva, VIII-1951

Chorology: PRT. (26).
Substrate: *Asparagus albus*

# **Cucurbitaria astragali** P.Karst. & Har., Rev. Mycol. (Tolouse) 12:171. 1890

Chorology: ESP.- M (49), (118).
Substrate: *Astragalus narbonensis*
Herbaria: MA-Fungi

? **Cucurbitaria dulcamarae** (Kunze & Schmidt:Fr.) Fr., Summ. veg. Scand. :391. 1849
≡ *Sphaeria dulcamarae* Kunze & Schmidt:Fr, Syst. mycol. 2:421. 1823

Chorology: ESP. M (51), (11), (118).

Substrate: *Solanum jasminoides*

? **Cucurbitaria gleditschiae** (Schwein.) Ces. & De Not., Comment. Soc. Crittog. Ital. 1:214. 1863
≡ *Sphaeria gleditschiae* Schwein., Schriften Naturf. Ges. Leipzig 1:40. 1822

Chorology: ESP. M (53).
Substrate: *Gleditschia triacanthus*

? **Cucurbitaria ignavis** De Not., Sfer. Ital., Accad. Sc. Torino :61. 1863
Teichospora ignavis (De Not.) P.Karst., Mycol. Fenn. 2:65. 1873

Chorology: ESP.- B (52), (101); Se (45), (50), (118).
Substrate: *Lonicera biflora, Lonicera caprifolium, Lonicera etrusca*
Herbaria: MA-Fungi

? **Cucurbitaria naucosa** (Fr.) Fuckel, Symb. mycol. 23-24:173. 1870
≡ *Sphaeria naucosa* Fr., in Kunze & Schmidt, Mykol. Hefte 2:36. 1823

Chorology: ESP.- M (46)
Substrate: *Ulmus campestris*

Observations : The species is doubtful (WELCH, 1926) and there is no material at the herbaria.

? **Cucurbitaria occulta** Fuckel, Symb. mycol. 23-24:173. 1870

Chorology: PRT. E (19).
Substrate: *Rosa* sp

? **Cucurbitaria pulchella** Fabre

Chorology: ESP. M (46), (118).
Substrate: *Ulmus campestris*

? **Cucurbitaria ribis** (Fr.:Fr.) Niessl, Verh. Naturf. Vereins Brünn 10:198. 1871

Chorology: ESP.- M (11), (52), (118).
Substrate: *Ribes aureus*

Observations : There is no material at the herbaria.

? **Cucurbitaria rutae** Fabre

Chorology: ESP. Se (50), (118).
Substrate: *Ruta graveolens*
Herbaria: MA-Fungi

? **Decaisnella spectabilis** Fabre, Ann. Sci. Nat., Bot., sér. 6, 9:112. 1879
=*Teichospora spectabilis* (Fabre) Sacc., Syll. Fung. 2:299. 1883
Chorology: ESP. Mll (96).
Substrate: *Olea europea*

Observations : There is no material at the herbaria.

? **Fenestella cydonia** M.E.A.Costa & Sousa da Câmara, Agron. Lusit. 17(2/4):153. 1955
Typus.- Portugal, Estremadura, Lisboa (Tapada d´Ajuda), on stems of *Cydonia oblonga*, García Cabral VIII-1954

Chorology: PRT.- E (34).
Substrate: *Cydonia oblonga*

? **Fenestella phaeospora** Sacc., Fungi Venet. Sev. IV:13. 1875

Chorology: PRT.- BL (8), (103), (118).
Substrate: *Quercus* sp.

# **Fenestella vestita** (Fr.:Fr.) Sacc., Michelia 1:50. 1877
≡ *Sphaeria vestita* Fr.:Fr, Syst. mycol. 2:410. 1823

Chorology: PRT. E (35)
Substrate: *Aloë* sp.

? **Montagnula dura** (Niessl) Crivelli, "Diss." ETH, Zürich, n. 7318:164. 1983
≡*Pleospora dura* Niessl, Verh. Naturf. Vereins Brünn 14:178. 1876
= *Pleospora xylostei* Fautrey, Rev. Mycol. (Tolouse) :70. 1896

Chorology: ESP. Na (44), (77), (125).
Substrate: *Lonicera etrusca*

? **Montagnula obtusa** (Fuckel) Crivelli, "Diss." ETH, Zürich, n. 7318:163. 1983
≡ *Teichospora obtusa* Fuckel, Symb. mycol. 2:30. 1873

Chorology: PRT.- DL (118); TM (118).
Substrate: *Pinus pinaster*
? **Montagnula palmacea** (Cooke) Aptroot, Nova Hedwigia 60(3-4) :341 (1995)
≡ *Sphaeria palmaceae* Cooke, Grevillea 7 :12 (1878),
= *Didymosphaeria cocoes-capitatae* Caballero, Anales Jard. Bot. Madrid 1 :180 (1940).
Typus.- In MA-Fungi (11805). Spain, Valencia, Botanical Garden, on living leaves of *Cocos capitata*, Caballero, IV-1938.

Chorology : ESP.- V (10)
Substrate : Leaves of *Cocos capitata*
Herbaria : MA-Fungi

Observations : I agree with Barr (in ERIKSSON & HAWKSWORTH, 1993) in repositioned the species with didymosporous ascospores in another genus.

? **Montagnula spartii** (Castagne) Aproot, Nova Hedwigia 60(3-4) : 342 (1995).
≡ *Sphaeria spartii* Castagne, Catalogue des plantes qui croissent naturellement aux environs de Marseille : 169 (1845).
= *Didymosphaeria epidermidis* var. *calycotomes-spinosae* Gonz.Frag., Treb. Inst. Bot. Barcelona 1(2) :1-88

Chorology : ESP : B (52)
Substrate : *Calycotome spinosa*

? **Pleospora asperulae** Pass., Nuovo Giorn. Bot. Ital. 7:257. 1875
Chorology: ESP.- Cc (113), (118); Se (50), (118).
Substrate: *Asperula aristata Asperula procumbens*
Herbaria: MA-Fungi

? **Pleospora betae** (Berl.) Newadowski, Griby rossi exsiccati :247. 1915

≡ *Pyrenophora echinella* var. *betae* Berl., Nuovo Giorn. Bot. Ital. 20:208. 1888

Chorology: PRT.- Bal (86) ; BL (86).
Substrate: *Beta vulgaris* ssp. *vulgaris*
Herbaria: LISE

Observations : It was only possible to observe the asexual form belonging to *Phoma betae* Franz

? **Pleospora boryana** Maire, Cavanillesia 8(9-10):134. 1938
Typus.- Spain, Granada, Sierra Nevada, Pico del Mulhacén, on stems of *Reseda complicata*

Chorology: ESP.- Gr (87), (118).
Substrate: *Reseda complicata*

? **Pleospora briardiana** Sacc., Rev. Mycol. (Tolouse) :158. 1885

Chorology: ESP.- Hu (74).
Substrate: *Verbascum thapsus*

? **Pleospora caricis-pendulae** Unamuno, Bol. Soc. Esp. Hist. Nat. 29:396. 1929
Typus.- In MA-Fungi 8939, Spain, Burgos, La Vid, on leaves of *Carex pendula,* T.Asensio, III-1928

Chorology: ESP.- Bu (108), (118).
Substrate: *Carex pendula*
Herbaria: MA-Fungi

? **Pleospora casaliana** Sacc. & P.Sydow, Syll. Fung. 14:598. 1899

Chorology: PRT. E (16).
Substrate: *Daphne gnidium*

? **Pleospora castaniicola** (Desm.) Sacc., in Migula, Krypt.-Fl. :151. 1904
Chorology: ESP.- B (40).
Substrate: *Castanea vesca*

? **Pleospora convallariae** f. **polygonati** Feltgen, Vorst. Pilz-Fl. Luxemburg., Nachtr. 3:184. 1903

Chorology: ESP.- Po (73)
Substrate: *Polygonatum vulgare*

? **Pleospora coronillae** Severini, Ann. Bot. 11:196. 1913

Chorology: PRT.- E (84).
Substrate: *Coronilla glauca*
Herbaria: LISE

# **Pleospora doliolum** (Pers.) Tul., Sel. Fung. carp. 2:276. 1801
≡ *Sphaeria doliolum* Pers., Syn. meth. Fung. :78. 1801

Chorology: ESP:Without locality, (71)
Substrate : Unidentified stems of *Apiaceae.*

Observations : It is *Leptosphaeria doliolum* (Pers.) Ces. & De Not.

# **Pleospora donacina** (Fr.) Niessl, Verh. Naturf. Vereins Brünn 14:183. 1876

Chorology: ESP.- Or (114), (118).
Substrate: *Arundo donax*

? **Pleospora echiicola** Petrak, Ann. Mycol. 22:24. 1924

Chorology: ESP.- B (93), (118).
Substrate: *Phagnalon saxatile*

? **Pleospora gigaspora** var. **meridiana** Rolland, Bull. Soc. Mycol. France 21:25. 1905
Typus.- Spain, Mallorca, Sa Font de S´Olla, on *Asphodelus microcarpus*

Chorology: ESP.- Mll (67), (96).

Observations : It is probably *Pl. anthyllidis* var. *abbreviata* (WEHMEYER,1961).

? **Pleospora herbarum** f. **coronillae** Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 12:18. 1917

Chorology: ESP. Cu (4); M (51), (118).
Substrate: *Coronilla emeroides, Coronilla minima* var. *australis*
Herbaria: MA-Fungi

? **Pleospora herbarum** f. **dracaenae**

Chorology: ESP.- C (118).
Substrate: *Dracaena draco*

? **Pleospora herbarum** f. **genista-ibericae** Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 12:18. 1917
Typus.- Spain, Madrid, Real Jardín Botánico, on branches of *Genista iberica*, A.Caballero.

Chorology: ESP.- M (51), (118).
Substrate: *Genista iberica*

? **Pleospora imparseptata** Sousa da Câmara, Anais Inst. Super. Agron. 3:76. 1930
Typus.- Portugal, Estremadura, Parede (Cascais), branches of *Arbutus unedo*, Branquinho de Oliveira, X-1928

Chorology: PRT.- E (13), (118).
Substrate: *Arbutus unedo*

? **Pleospora lepidii** Hollós, Ann. Hist.-Nat. Mus. Natl. Hung. 5:454. 1907

Chorology: ESP.- B (118).
Substrate: *Lepidium graminifolium*
Herbaria: MA-Fungi

Observations. The ascospores are inmature.

? **Pleospora lini-cathartici** Unamuno, Bol. Soc. Esp. Hist. Nat. 30:181. 1930
Typus.- In MA-Fungi 9046, Spain, Oviedo, Llanes, Leaves and stems of *Linum catharticum*, L.M. Unamuno, 20-VII-1029

Chorology: ESP.- O (110), (118).
Substrate: *Linum catharticum*
Herbaria: MA-Fungi

Observations : The ascospores are inmature.

? **Pleospora lusitanica** Pass. & Thüm., Instituto (Coimbra), Sér. 2, 28(8):365. 1881

Typus.- Portugal, Beira Litoral, San Bento, Coimbra, stems of *Daucus carota,* Moller

Chorology: PRT.- BL (97), (102), (118). Without locality (103).
Substrate: *Daucus carota*

# **Pleospora maculans** (Desm.) Tul., Sel. Fung. carp. 2:274. 1863
≡ *Sphaeria maculans* Desm., Ann. Sci. Nat., Bot., sér. 3, 6:77. 1846

Chorology: ESP:Without locality, (71)

Observations : It is *Leptosphaeria maculans* (Desm.) Ces. & De Not.

? **Pleospora mallorquina** Rolland, Bull. Soc. Mycol. France 21:26. 1905
Typus.- Spain, Mallorca, Coma Negra, stems of *Urginea scilla*, L. Rolland

Chorology: ESP.- Mll (67), (96).
Substrate: *Urginea scilla*

? **Pleospora mauritanica** Maire, Bull. Soc. Bot. France 53:cxcii. 1906
Typus.- Spain, Barcelona, Montserrat, on *Asphodelus cerasiferus*, 21-V-1929

Chorology: ESP.- B (93), (118).
Substrate: *Asphodelus cerasiferus*

Observations : It is a species closed to *Pl. coloradensis* Ellis & Everh. (WEHMEYER, 1961).

? **Pleospora media** var. **hortensiae** Bausá, Anales Jard. Bot. Madrid 5:148. 1945
Typus.- Ind. Loc. Spain, Cáceres, Baños de Montemayor, on *Hydrangea hortensia*

Chorology: ESP.- Cc (4)
Substrate: *Hydrangea hortensia*

Observations : There is no material in the herbaria and the description is uncomplete.

? **Pleospora mucosa** (Pers.:Fr.) Speg., Mem. Soc. Crittog. Ital., . 1880
≡ *Sphaeria mucosa* Pers.:Fr., Syst. mycol. 2:425. 1823

Chorology: ESP.- Se (50), (118).
Substrate: *Cucurbita maxima*
Herbaria: MA-Fungi

? **Pleospora nevadensis** Petrak, Ann. Mycol. 29:116. 1931
Typus.- Spain, Granada, Dornajo, Sierra Nevada, stems of *Ptilotrichum spinosum*, 2-VI-1929
Chorology: ESP.- Gr (93), (118).
Substrate: *Ptilotrichum spinosum*

Observations : WEHMEYER (1961) indicated that this species is probably, by the description, *Pl. tragacanthae* or *Pl. comata.*

? **Pleospora oligomera** f. **phlomidis** Gonz.Frag., Trab. Mus. Ci. Nat., Ser. Bot. 10:93. 1916
Typus.- Spain, Barcelona, Botanical Garden of the University, on *Glycine sinensis*, IV-1918

Chorology: ESP.- B (54); Se (118).
Substrate: *Glycine sinensis, Phlomis purpurea*

# **Pleospora refracta** (Kalchbr. & Cooke) Sacc., Syll. Fung. 2:243. 1883
≡ *Sphaeria refracta* Kalchbr. & Cooke, Grevillea 9:30. 1880

Chorology: ESP.- M (118).
Substrate: *Artemisia glutinosa*
Herbaria: MA-Fungi

? **Pleospora robertiana** G.Boyer & Jacz., Bull. Soc. Bot. France 40:279. 1893

Chorology: ESP.- Cu (118), (119).
Substrate: *Genista scorpius*

? **Pleospora rosarum** Gonz. Frag, Bol. Soc. Esp. Hist. Nat. 24:443. 1924
Typus.- In MA-Fungi 5165, Spain, Madrid Navacerrada, Estación Alpina de Biología, stems of *Rosa* sp., R. González Fragoso, VIII-1922

Chorology: ESP.- M (58), (118).
Substrate: *Rosa canina, Rosa* sp.
Herbaria: MA-Fungi

? **Pleospora septemseptata** (Auersw.) Sacc., Syll. Fung. 2:271. 1883
≡ *Sphaeria septemseptata* Auersw., in Willkkomm, Flora 35:536. 1852

Chorology: ESP.- Hu (118).
Substrate: *Festuca eskia*

? **Pleospora** sp. Unamuno, Anales Jard. Bot. Madrid 4:153. 1944

Chorology: ESP.- Ba (121).
Substrate: *Cichorium inthybus*

? **Pleospora** sp. Nadal, Montos & Serra, VIII Jornadas de Productos Fitosanitarios :89. 1982

Chorology: ESP.- B (90).
Substrate: *Dianthus caryophyllus*

? **Pleospora** sp. Losa España, Anales Jard. Bot. Madrid 8:311. 1949

Chorology: ESP.- Hu (74).
Substrate: *Lithospermum officinale*

? **Pleospora** sp. Gallego, Pedreño & Honrubia, Anales. Biol., Fac. Biol., Univ. Murcia, Secc. Biol. Veg. 9:31. 1986

Chorology: ESP.- Mu (43).
Substrate: *Olea europaea*
Herbaria: "Herb. EGA"
? **Pleospora spinosae** Rolland, Bull. Soc. Mycol. France 21:25. 1905
Typus.- Spain, Mallorca, Sa Coma, branches of *Calycotome spinosa*, H.Knoche, February.

Chorology: ESP.- Mll (67), (96)
Substrate: *Calycotome spinosa*

Observations : WEHMEYER (1961) indicated that it is probably *Pl. pellita* var. *bardanae*.

? **Pleospora wehmeyeri** M.T.Lucas, Mem. Soc. Brot. 21:46. 1971
Typus.- In LISE 733056, Portugal, Beira Litoral, leaves of *Crucianella maritima*

Chorology: PRT. Bal (81)

Substrate: *Crucianella maritima*
Herbaria: LISE

Observations : It is similar to *Pl. herbarum* with smaller spores.

? **Pyrenophora eryngiicola** Losa España, Anales Jard. Bot. Madrid 8:311. 1947
Typus.- Spain, Huesca, Valle de Ordesa, on *Eryngium bourgatii*, T.M. Losa España

Chorology: ESP.- Hu (74).
Substrate: *Eryngium bourgatii*

? **Pyrenophora macrospora** (J.Schröt.) Wehm., A World Monograph of the Genus *Pleospora* and its Segregates :278. 1961
≡ *Pleospora macrospora* J.Schröt., Jahresber. Schles. Ges. Vaterl. Cult. 15:. 1881

= *Pyrenophora brizae* C.Massal., Ann. Mycol. 9:250. 1911

Chorology: ESP.- Ge (54), (118).
Substrate: *Briza media*

? **Pyrenophora phaeocomes** (Rebent.:Fr.) Fr., Summ. veg. Scand. 2:. 1849
≡ *Sphaeria phaeocomes* Rebent.:Fr., Syst. mycol.2 :515. 1823

= *Pleospora phaeocomes* , in Rabenh., Krypt.-Fl. 1(2):521. 1887
Chorology: PRT.- BL (118), (132), (133). Without locality(103).
Substrate: *Vitis vinifera*

? **Pyrenophora polytricha** Sousa da Câmara, Bol. Agric. (Lisboa), I S,r. 2(1):16. 1936
Typus.- Portugal, Estremadura, Lisboa, Tapada d´Ajuda, on *Avena sterilis*, Silva Teixeira, VI-1935

Chorology: PRT.- E (14), (118).
Substrate: *Avena sterilis*
Herbaria: MA-Fungi

Observations : The material is no good and there is another species with the same name (*P. polytricha* (Wallr.) Wehm.

? **Teichospora artemisiae** Fabre, Ann. Sci. Nat., Bot., sér. 6, 9:111. 1879

Chorology: ESP.- M (46), (118).
Substrate: *Artemisia glutinosa*

? **Teichospora florentina** Berl., Pug. Funghi Fior. :17

Chorology: PRT.- Mi (18), (56), (118).
Substrate: *Olea europea*

? **Teichospora ignavis** f. **barcinonensis** Gonz.Frag., Treb. Inst. Bot. Barcelona 1(2):93. 1917
Typus.- Spain, Barcelona, San Gervasio´s Gardens, R. González Fragoso, XII-1914

Chorology: ESP.- B (52), (118).
Substrate: *Lonicera canescens*,
Herbaria: MA-Fungi

? **Teichospora phragmitis** Pass., Rev. Mycol. (Tolouse) 2:35. 1880

Chorology: PRT.- E (2), (118). Without locality (103).
Substrate: *Phragmites communis*

? **Teichospora** sp. Honrubia, Larios & Gallego, Anales Jard. Bot. Madrid 42(1):46. 1985
Chorology: ESP.- Ab (66).
Substrate: unidentified branch.
Herbaria: "Herb. JL"

ACKNOWLEDGEMENTS

I want to express my gratitude to Dr. M.E.Barr (Sidney, Canada) and Dr. L.Holm (Uppsala, Sweden) for the revision of the paper and their commentaries. I am very grateful to J. Rejos (curator of AH) and Dr. I. Saraiva (curator of LISE) for their help in the search of the material.

REFERENCES

Aptroot, A. (1995). A Monograph of Didymosphaeria. Stud. Mycol. 37 :1-160.
Barr, M.E. (1990 a). Some dictyosporous genera and species of Pleosporales in North America. Mem. New York Bot. Gard. 62 :1-92.

Barr, M.E. (1990 b). Melanommatales (Loculoascomycetes). North American Flora 2(3):1-129.

Berlese, A.N. (1888). Monografia dei generi *Pleospora, Clathrospora* e *Pyrenophora.* Nuovo Giorn. Bot. Ital. 20 :6-260.

Checa, J. (1997 a). Annotated list of the Hysteriaceae (Dothideales, Ascomycotina) reported from the Iberian Peninsula and Balearic Islands. Mycotaxon 62 :349-374.

Checa, J. (1997 b). Annotated list of the Lophiostomataceae and Mytilinidiaceae (Dothideales, Ascomycotina) reported from the Iberian Peninsula and Balearic Islands. Mycotaxon 63 :467-491

Checa, J. (1997 c). Bases Corológicas de Flora Micológica Ibérica.Números 1286-1411. Cuadernos de Trabajo de Flora Micológica Ibérica 12. Consejo Superior de Investigaciones Científicas. Real Jardín Botánico. Madrid.

Crivelli, G. (1983). Ueber die heterogene Ascomycetengattung *Pleospora* RABH. ; Vorschlag für eine Aufteilung. Diss. ETH Nr. 7318 :1-213.

Eriksson, O. & Hawksworth,D.L. (1993). Notes on ascomycete systematics. Nos. 1530-1610. Syst. Ascomycetum 12 :23-50.

Hawksworth, D.L., Kirk, P.M., Sutton, B.C. & Pegler, D.N. (1995). Ainsworth & Bisby´s. Dictionary of the fungi (8° ed.).CABI.

Shoemaker, R.A. & Babcock, C.E. (1992). Applanodicyosporous Pleosporales : *Clathrospora, Comoclathris, Graphyllium, Macrospora,* and *Platysporoides.* Canad. J. Bot. 70 :1617-1658.

Simmons, E.G. (1986). *Alternaria* themes and variations. Mycotaxon 25(1) :287-308.

Sivanesan, A. (1984). The Bitunicate Ascomycetes. J.Cramer

Wehmeyer, L.E. (1961). A World Monograph of the Genus *Pleospora* and its segregates. Univ. Michigan Press.

Welch, D.S. (1926). A monographic study of the genus *Cucurbitaria.* Mycologia 18 :51-86.

MYCOTAXON

Volume LXVIII, pp. 251-263 July-September 1998

CONIDIUM DEVELOPMENT IN HYALODENDRON AND ALLESCHERIELLA ANAMORPHS OF OPHIOSTOMA AND CERATOCYSTIOPSIS

E. BENADE, M.J. WINGFIELD AND P.S. VAN WYK

Department Microbiology and Biochemistry, University of the Orange Free State, P.O. Box 339, Bloemfontein 9300, South Africa

Anamorphs of *Ophiostoma* have been separated by their patterns of conidium development. This has resulted in the establishment of an unduly large number of genera. The aim of this study was to consider the validity of including the genera *Hyalodendron* and *Allescheriella* amongst the anamorphs of *Ophiostoma* and *Ceratocystiopsis*. Scanning electron micrographs (SEM) of the so-called *Hyalodendron* anamorphs of *Ophiostoma piliferum* and *O. pluriannulatum* revealed the presence of denticulate conidiogenous cells, typical of *Sporothrix* spp. Secondary conidia found in *Sporothrix* and *Hyalodendron* spp. were also present. SEM and transmission electron micrographs of the purported *Allescheriella* anamorph of *Ceratocystiopsis retusi* revealed conidiogenous cells that proliferate sympodially to form peg-like denticles, characteristic of *Sporothrix* spp. In some cases, however, annellations were also found on these conidiogenous cells. Here they formed an intermediate state between annellidic conidium development in *Hyalorhinocladiella* and sympodial development in *Sporothrix*.

A SEM examination revealed the presence of hyphal swellings in the anamorph of *C. retusi*, previously incorrectly interpreted as conidia, explaining its disposition in *Allescheriella*. We conclude that the anamorphs of *O. piliferum, O. pluriannulatum* and *C. retusi* are *Sporothrix* spp. and that the genera *Hyalodendron* and *Allescheriella* should be removed from the list of Ophiostomatoid anamorphs.

INTRODUCTION

Ophiostoma H.&P. Sydow and *Ceratocystiopsis* H.P. Upadhyay & W.B. Kendr. spp. can be distinguished from *Ceratocystis sensu stricto* based on conidium development. *Ceratocystis s.s.* has *Chalara* (Corda) Rabenh. anamorphs (Weijman & De Hoog, 1975; Upadhyay, 1981; De Hoog & Scheffer, 1984) where conidia develop through ring wall building (Minter, Kirk & Sutton, 1983; De Hoog & Scheffer, 1984). In contrast, *Ophiostoma* spp. have anamorphs characterized by apical wall building (Minter *et al.*, 1983). These include genera such as *Hyalodendron* Diddens, *Sporothrix* Hektoen & C.F. Perkins, *Hyalorhinocladiella* H.P. Upadhyay & W.B. Kendr., *Graphium* Corda and *Leptographium* Lagerb. & Melin (Upadhyay & Kendrick, 1975; Upadhyay, 1981; Wingfield, 1985; Harrington, 1987).

Many anamorphs of *Ophiostoma* have been separated on the basis of conidium development. This trend began with the classic paper by Hughes (1953) introducing this feature as an additional morphological criterion, also separating *Verticicladiella* S. Hughes from *Leptographium* with sympodial and annellidic conidium development, respectively. In recent years, the validity of many of these genera has been questioned and the number of genera has been reduced (Wingfield, 1985; Wingfield, Kendrick & Van Wyk, 1991; Mouton, Wingfield &

Van Wyk, 1993a). Indeed, it has been suggested that anamorphs of *Ophiostoma* and *Ceratocysistiopsis* could be restricted to as few as five genera (Mouton, Wingfield & Van Wyk, 1993b).

The genus *Hyalodendron* was established by Diddens (1934), and is characterized by conidiogenous cells that are indeterminate, producing one to a few holoblastic conidia on short peg-like projections at the tips, or in whorls along the sides of simple or branched conidiophores (Upadhyay, 1981). These primary conidia produce secondary conidia in short, acropetal, lateral or terminal chains (De Hoog, 1979; Upadhyay, 1981). *Hyalodendron* is considered the hyaline analogue of *Cladosporium* Link (Upadhyay, 1981).

The name *Hyalodendron* has been assigned to several anamorphs of *Ophiostoma* spp. (Upadhyay, 1981; De Hoog, 1993). For example, Upadhyay (1981) described the anamorphs of *Ophiostoma piliferum* (Fr.) C. Moreau and *Ophiostoma pluriannulatum* (Hedgc.) H.&P. Sydow as having conidiogenous cells that proliferate sympodially forming conidia in acropetal or in branched chains. Cylindrical ramoconidia were also present. The presence of acropetal chains and ramoconidia led him to suggest that these anamorphs of *Ophiostoma* should be placed in *Hyalodendron*.

Sporothrix differs from *Hyalodendron* by the occurrence of prominent denticles on the conidiogenous cells (De Hoog, 1974). The formation of secondary and tertiary conidia, characteristic of *Hyalodendron*, can also be found in *Sporothrix* anamorphs such as those of *Ophiostoma perfectum* (R.W. Davidson) de Hoog, *Ophiostoma piceae* (Münch) B.K. Bakshi and *Ophiostoma nigrocarpum* (Davidson) de Hoog (de Hoog, 1974). Given that *Sporothrix* is amongst the most common anamorphs of *Ophiostoma* and *Ceratocystiopsis*, it is also understandable that *Hyalodendron* has been included amongst their anamorphs.

The genus *Allescheriella* Henn. has also been included amongst the anamorphs of *Ceratocystis sensu lato*. T.E. Hinds & R.W. Davidson (1972) first described the species *Ceratocystis retusi* R.W. Davidson & T.E. Hinds and provided an illustrated description (Fig. 1) of its anamorph. The anamorph was described as having hyaline, ovate conidia, borne singly, laterally and apically on hyphae, usually with an annular frill at the base (Hinds & Davidson, 1972). Upadhyay (1981) transferred the fungus to *Ceratocystiopsis* and concluded that the anamorph belongs in *Allescheriella*.

The aim of this study was to consider the validity of applying the generic names *Hyalodendron* and *Allescheriella* to the anamorphs of Ophiostomatoid fungi. Two species, *O. piliferum* and *O. pluriannulatum* with anamorphs that were assigned to *Hyalodendron* by Upadhyay (1981) were considered in the former case. The anamorph of *C. retusi* that has been assigned to *Allescheriella* was examined in the latter case.

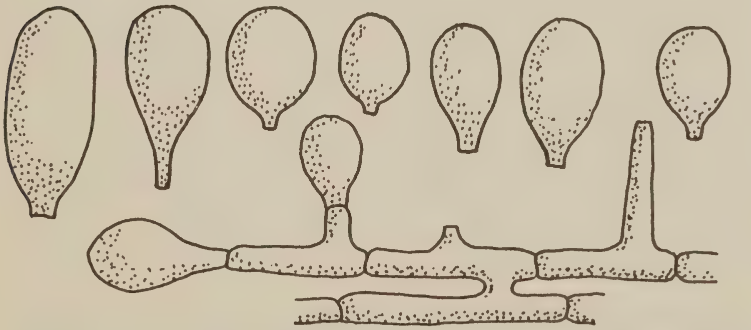
MATERIALS AND METHODS

Isolates of the fungi used in this study originated from the collection of Dr. R.W. Davidson (COLO). They were as follows: *O. piliferum* (COLO-487, COLO-432), *O. pluriannulatum* (C-416), and *C. retusi* (C-494, CO-494). These cultures were obtained from Dr. T. Hinds, U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Fort Collins, Colorado, United States. Isolates were grown on 2 % malt extract agar (20 g Biolab malt extract; 20 g Biolab agar; 1000 ml H_2O) in Petri dishes and incubated at 25 °C until the onset of sporulation.

Conidial development was examined using scanning (SEM) and transmission (TEM) electron microscopy. Material for SEM and TEM was cut from the agar and fixed using 3 %

glutaraldehyde and 1 % osmium tetroxide in 0.1 M buffer (pH 7). The material was then dehydrated in a graded acetone series. Specimens for SEM were critical point dried, mounted, coated with gold/palladium and examined with a JSM 6400 scanning electron microscope.

Material for TEM was fixed in a similar manner and embedded according to Spurr (1969) with the following modifications: The material was placed in epoxy resin and acetone (1:1) for 90 min at room temperature. The epoxy resin and acetone was replaced by new epoxy resin for 30 min at room temperature, followed by 30 min at 50 °C. The resin was again replaced and the material was placed in a oven for 60 min at 50 °C. Specimens were embedded in pre-heated gelatin



1

Fig. 1 Diagrammatic illustration of the hyphal swellings found in *Ceratocystiopsis retusi* (Redrawn from Hinds & Davidson, 1972).

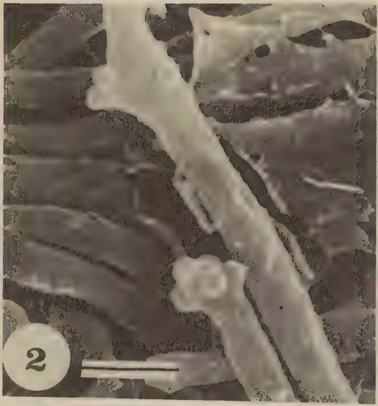
capsules where the epoxy resin was polimerized at 70 °C overnight. Ultrathin sections (60 nm) were made with glass knives, and mounted on copper grids. Sections were stained for 30 min in uranyl acetate followed by 5 min in lead citrate (Reynolds, 1963) and examined with a Phillips 301 transmission electron microscope.

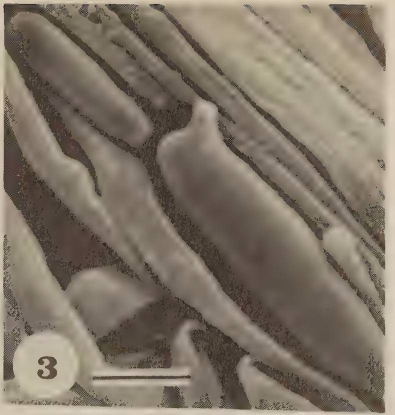
RESULTS

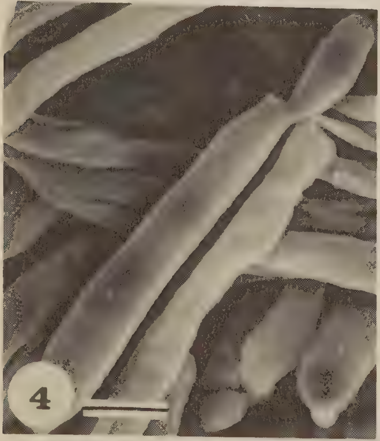
Scanning electron micrographs of the anamorph of *O. piliferum* revealed conidiogenous cells typical of *Sporothrix* spp. Here distinct, peg-like denticles could be distinguished at the conidiogenous loci (Fig. 2). Conidia were typically cylindrical to clavate and commonly exhibited secondary conidiation (Figs 3, 4).

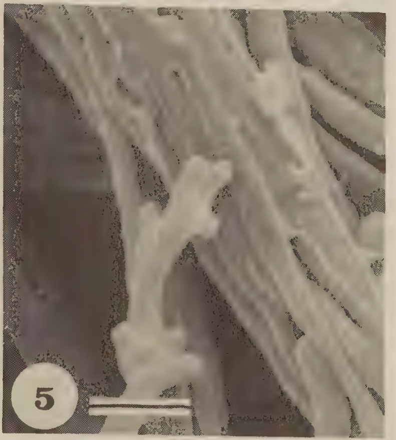
Conidium development in *O. pluriannulatum* was similar to *O. piliferum* revealing prominent peg-like denticles on the conidiogenous cells. These denticulate conidiogenous cells are characteristic of those found in *Sporothrix* spp. (Figs 5, 6). An abundance of clavate ramoconidia characterized by more than one attachment point were found (Fig. 7).

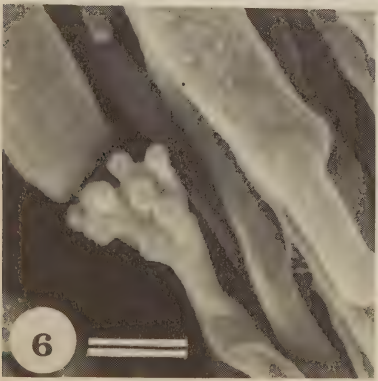
Figs 2-7 Conidiophores, conidiogenous cells and conidia of *Ophiostoma piliferum* and *Ophiostoma pluriannulatum*. Fig. 2 SEM of *O. piliferum* showing distinct peg-like denticles at the apex of the conidiogenous cell (Bar = 2 µm). Figs 3-4 Cylindrical to clavate conidia of *O. piliferum* exhibiting secondary conidiation (Bar = 2 µm). Figs 5-6 SEM of denticulate conidiogenous cells of *O. pluriannulatum* forming *Sporothrix*-like structures (Bar = 2 µm). Fig. 7 Fusiform to clavate ramoconidia of *O. pluriannulatum* have more than one basal delimiting septum (Bar = 2 µm).

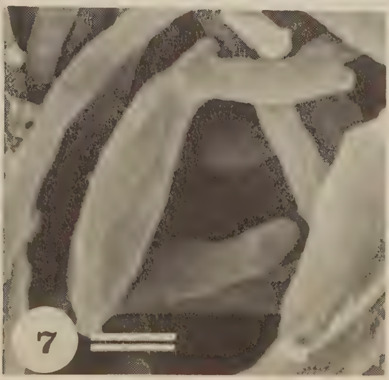

2


3


4


5


6


7

In *C. retusi*, conidia most commonly developed from conidiogenous cells bearing *Sporothrix*-like denticles (Fig. 8). Occasionally, however, conidiogenous cells had distinct annellations typical of percurrent proliferation (Fig. 9). Such percurrent proliferation could also be observed in the formation of secondary conidia.

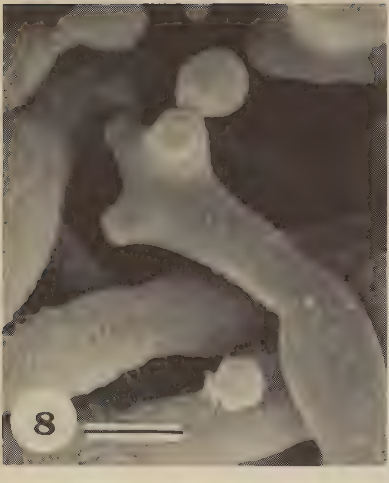
Despite repeated attempts, it was not possible to obtain TEM micrographs of *C. retusi* conidiogenous cells exhibiting percurrent proliferation. This was undoubtedly due to their infrequent occurrence. TEM sections through typical *Sporothrix* conidiogenous cells showed that conidiogenous loci become plugged with wall material after conidial secession (Fig. 10).

Although Hinds & Davidson (1972) reported single apically and laterally borne conidia in *C. retusi,* none could be found in this study. Several apical and intercalary hyphal swellings resembling chlamydospores were, however, observed (Fig. 11).

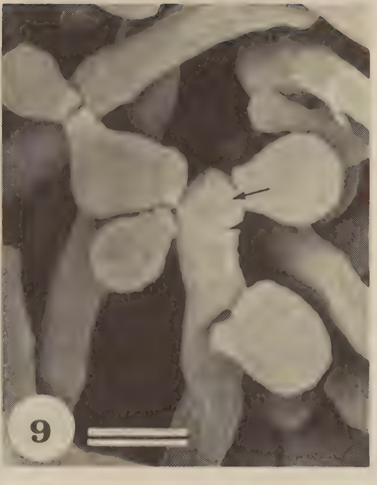
DISCUSSION

Results of this study show conclusively that assignment

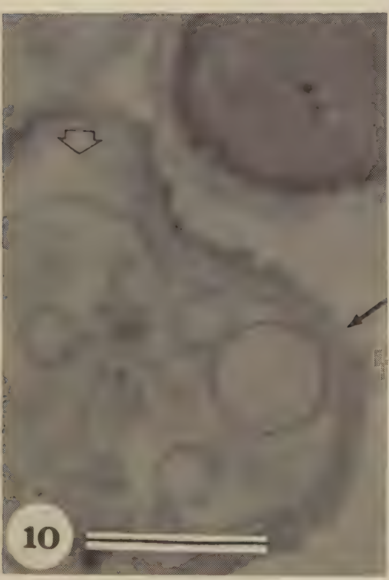
Figs 8-11 Conidia and conidiogenous cells of the anamorph of *Ceratocystiopsis retusi*. Fig. 8 Conidiogenous cells of *C. retusi* have short, cicatrized, peg-like denticles typical of *Sporothrix* spp. (Bar = 2 µm). Fig. 9 SEM of conidiogenous cells with distinct annellations (Arrows) (Bar = 2 µm). Fig. 10 TEM of a section through a conidiogenous cell revealing two conidiogenous loci. The one conidiogenous locus (Arrow⇳) is plugged with wall material while a new conidium is being formed at the other (Arrow ⟵) (Bar = 1 µm). Fig. 11 SEM of apical and intercalary hyphal swellings (Bar = 2 µm).



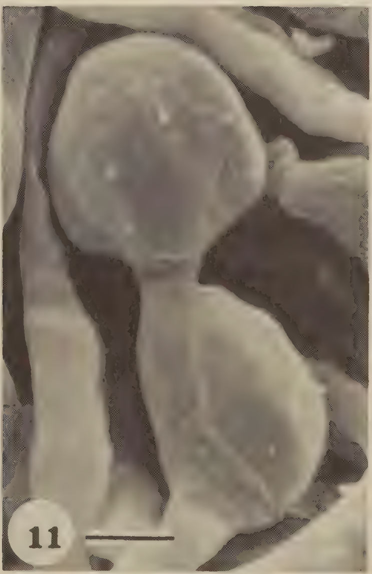
8



9



10



11

of the anamorphs of *O. piliferum* and *O. pluriannulatum* to *Hyalodendron* cannot be justified. Anamorphs of these two species are typical of *Sporothrix* with well developed, denticulate conidiogenous cells. The type species of *Hyalodendron,* i.e. *H. lignicola* Diddens is a Basidiomycete and the name should not, therefore, be applied to anamorphs of *Ophiostoma* (De Hoog, 1993).

We assume that the assignment of anamorphs of *O. piliferum* and *O. pluriannulatum* to *Hyalodendron* was based on the production of secondary and tertiary conidia. Indeed, secondary conidia can lead to the illusion of ramoconidia typical of *Hyalodendron* and *Cladosporium* and thus be misleading. Production of secondary and subsequent conidia from large primary conidia is a common characteristic in *Sporothrix* anamorphs of *Ophiostoma* (De Hoog, 1974).

The presence of typical *Sporothrix* conidiogenous cells as found in the anamorph of *C. retusi*, calls into question the assignment of this fungus to *Allescheriella.* These structures are not common and they were clearly not observed by previous authors. Here we assume that Hinds & Davidson (1972) mistook the commonly occurring intercalary and apical hyphal swellings for conidia. The same error was probably made by Upadhyay (1981) which would explain why he assigned the fungus to *Allescheriella.*

The observation of percurrently proliferating conidiogenous cells in the anamorph of *C. retusi* was of particular interest. This form of development is typical of *Hyalorhinocladiella* anamorphs of *Ophiostoma* (Benade, Wingfield & Van Wyk, 1996). In fact, it has previously been suggested (Benade, Wingfield & Van Wyk, 1997) that a continuum probably exists between the patterns of conidium development in *Hyalorhinocladiella* and *Sporothrix.* The issue at hand appears to concern the extent of the proliferation phase and the angle of displacement of this growth. It would be of interest to examine other species of *Sporothrix* to determine how commonly this overlapping of patterns of conidium development occurs.

The results of this study add further support to the contention of Mouton *et al.* (1993b) that there is an excessive number of names for anamorphs of *Ophiostoma* and *Ceratocystiopsis*. Certainly, in this case, the genera *Hyalodendron* and *Allescheriella* should be removed from the list of Ophiostomatoid anamorphs. It might also be expected that the various patterns of conidium development in *Ophiostoma* are fundamentally related. These fungi, therefore, include outstanding examples for further fundamental study of patterns of conidium development in anamorphic fungi.

ACKNOWLEDGEMENTS

We thank Prof P.W. Crous (Department of Plant Pathology, University of Stellenbosch) and Prof W.F.O. Marasas (Promec, Medical Research Council, Tygerberg) for reviewing this manuscript. We also acknowledge financial support of the Foundation for Research Development (FRD).

REFERENCES

Benade, E., Wingfield, M.J. & Van Wyk, P.S. 1996. Conidium development in the *Hyalorhinocladiella*, anamorphs of *Ceratocystiopsis minuta-bicolor* and *Ophiostoma minus. Canadian Journal of Botany* **74**, 891-897.

Benade, E., Wingfield, M.J. & Van Wyk, P.S. 1997. Conidium development in *Sporothrix* anamorphs of *Ophiostoma. Mycological Research* **101**, 1108-1112.

De Hoog, G.S. (1974). The genera *Blastobotrys*, *Sporothrix*, *Calcarisporium* and *Calcarisporiella gen. nov. Studies in Mycology* **7**, 1-84.

De Hoog, G.S. (1979). Taxonomic review of *Moniliella*, *Trichosporonoides* and *Hyalodendron*. *Studies in Mycology* **19**, 1-36.

De Hoog, G.S. (1993). *Sporothrix*-like anamorphs of *Ophiostoma* and other fungi. In: Ceratocystis *and* Ophiostoma: *Taxonomy, Ecology & Pathogenicity* (ed. M.J. Wingfield, K.A. Seifert & J.F. Webber), pp. 53-60. American Phytopathological Society.

De Hoog, G.S. & Scheffer, R.J. (1984). *Ceratocystis* versus *Ophiostoma* a reappraisal. *Mycologia* **76**, 292-299.

Diddens, H.A. (1934). Eine neve pulzgatting, *Hyalodendron*. *Centralblatt für Bakteriologie Parasitenkunde und Infektionskrankheiten* **90**, 315-319.

Harrington, T.C. (1987). New combinations in *Ophiostoma* of *Ceratocystis* species with *Leptographium* anamorphs. *Mycotaxon* **28**, 39-43.

Hughes, S.J. (1953). Conidiophores, conidia and classification. *Canadian Journal of Botany* **31**, 577-659.

Hinds, T.E. & Davidson, R.W. (1972). *Ceratocystis* species associated with the aspen ambrosia beetle. *Mycologia* **64**, 405-409.

Minter, D.W., Kirk, P.M. & Sutton, B.C. (1983). Thallic phialides. *Transactions of the British Mycological Society* **80**, 39-66.

Mouton, M., Wingfield, M.J. & Van Wyk, P.S. (1993a). Conidium development in the synnematous anamorphs of *Ophiostoma*. *Mycotaxon* **46**, 371-379.

Mouton, M., Wingfield, M.J. & Van Wyk, P.S. (1993b). Conidium development in anamorphs of *Ceratocystis sensu lato*: A review. *South African Journal of Science* **90**, 293-298.

Reynolds, E.S. (1963). The use of lead citrate at high pH as an electron-opaque stain in electron microscopy. *Journal of Cell Biology* **17**, 208-212.

Spurr, A.R. (1969). A low viscosity embedding medium for electron microscopy. *Journal of Ultrastructural Research* **26**, 31-43.

Upadhyay, H.P. (1981). *A monograph of* Ceratocystis *and* Ceratocystiopsis. The University of Georgia Press: Athens, Georgia.

Upadhyay, H.P. & Kendrick, W.B. (1975). Prodromus for a revision of *Ceratocystis* (Microascales, Ascomycetes) and its conidial states. *Mycologia* **67**, 798-805.

Weijman, A.C.M. & De Hoog, G.S. (1975). On the subdivision of the genus *Ceratocystis*. *Antonie van Leeuwenhoek* **41**, 353-360.

Wingfield, M.J. (1985). Reclassification of *Verticicladiella* based on conidial development. *Transactions of the British Mycological Society* **85**, 81-93.

Wingfield, M.J., Kendrick, B. & Van Wyk, P.S. (1991). Analysis of conidium ontogeny in anamorphs of *Ophiostoma*: *Pesotum* and *Phialographium* are synonyms of *Graphium*. *Mycological Research* **95**, 1328-1333.

MYCOTAXON

Volume LXVIII, pp. 265-271 July-September 1998

RUHLANDIELLA BEROLINENSIS, AN EXOTIC SPECIES IN EUROPE

R. GALÁN & G. MORENO

Departamento de Biología Vegetal (Botánica), Univ. Alcalá, E- 28871 Alcalá de Henares, Madrid, Spain.

SUMMARY: The authors emphasise the presence in the Iberian Peninsula, and also in Continental Europe, of *Ruhlandiella berolinensis* Hennings, a fungus having a semihypogeous habit, forming mycorrhizas with *Eucalyptus* spp., belonging to a monotypic genus of the Pezizales (Ascomycetes), and previously recorded from the USA, Canary Islands, Germany, and Tasmania. Our findings considerably enlarge its known distribution and also confirm its ecological host specificity. We describe the fungus macroscopically and microscopically, and provide the first SEM illustrations of spore ornamentation.

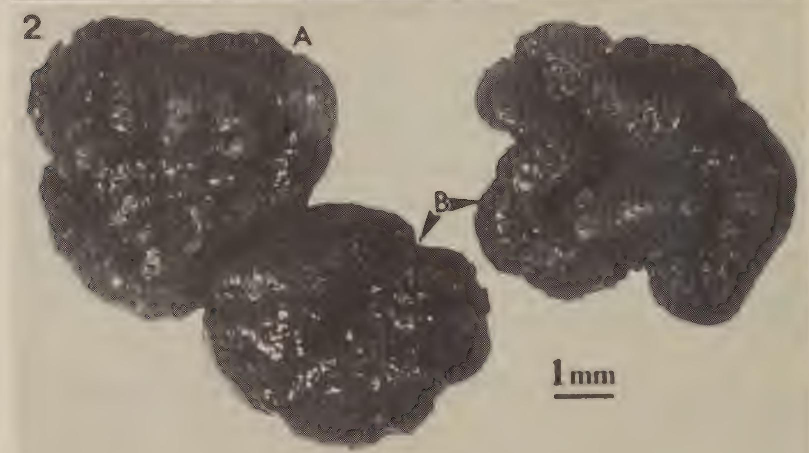
Key words: *Ruhlandiella berolinensis*, Ascomycetes, distribution, taxonomy, Spain.

INTRODUCTION

Samples were recorded and photographed by members of a local Mycological Society (Sociedad Micológica de Avilés) at three different localities, covering an area of 100 km^2 in Asturias province in the North of Spain, always in introduced plantations of eucalypts. In situ, the fungus was at first identified as *Hydnobolites cerebriformis* according the habit of the ascocarps and the fact that this was already reported in Spain and other European countries. Microscopic study revealed an exotic mycorrhizal fungus: *Ruhlandiella berolinensis*, unreported from the Iberian Peninsula.

After searching in the literature and discovering how few records there are concerning it, we decided to monograph it, adding details that were previously overlooked or under discussion. Microscopic examinations

1
A
B
C
1 mm


2
A
B
1 mm

3
C
1 mm

have been carried out in tap water for measurements of sporocarp elements , and in 2% aqueous KOH, Melzer`s reagent and Congo Red. The photomicrographs were made with a Nikon microscope, Optiphot model, equipped with phase-contrast and having an incorporated system of automatic photography. The SEM photographs have been carried out with a Zeiss DSM-950 microscope using the following technique: fragments of the hymenium were squashed with concentrated ammonium hydroxide (28-30 %) during 10 minutes, dehydrated in aqueous ethanol (70%) for 30 minutes and later immersed in pure acetone for 30 minutes also, followed by critical point drying and sputtering with gold-palladium.

Specimens have been deposited in AH (the herbarium of Alcalá University, Spain).

DESCRIPTION:

Ruhlandiella berolinensis Hennings *emend.* Dissing & Korf, *Mycotaxon* 12: 290 (1980). (Figs. 1-6).

= ? *Muciturbo reticulatus* Talbot *in* Warcup & Talbot, *Mycol. Res.* 92: 95 (1989)

Taxonomic position: Pezizaceae, Pezizales, Ascomycota.

Habitat: Subhypogeous, under *Eucalyptus globulus*.

Material studied: ASTURIAS: La Candaliega, *leg.* A. Suárez, 7.II.1997, AH 7087; *Idem*, *leg.* E. Rubio, 7.I.1998, AH 7156; Santa Cruz de Llanera, *leg.* A. Suárez, 5.XII.1997, AH 7149; Verdicio, *leg.* E. Rubio, 28.I.1998, AH 7159.

Fruitbodies (apothecia) 4-14 mm diam., pulvinate (hemispheric) -and then more or less massive- to subglobose and then showing a cavernous base where it is possible to see mycelial tufts with attached remains of soil. Hymenium always convolute, permanently exposed (i.e., peridium lacking), smooth to irregularly folded (brain-like) and sometimes becoming lobate, honey-yellow becoming vinous-lilac and later clay-buff, of rather cartilaginous consistency at first but deliquescing at maturity.

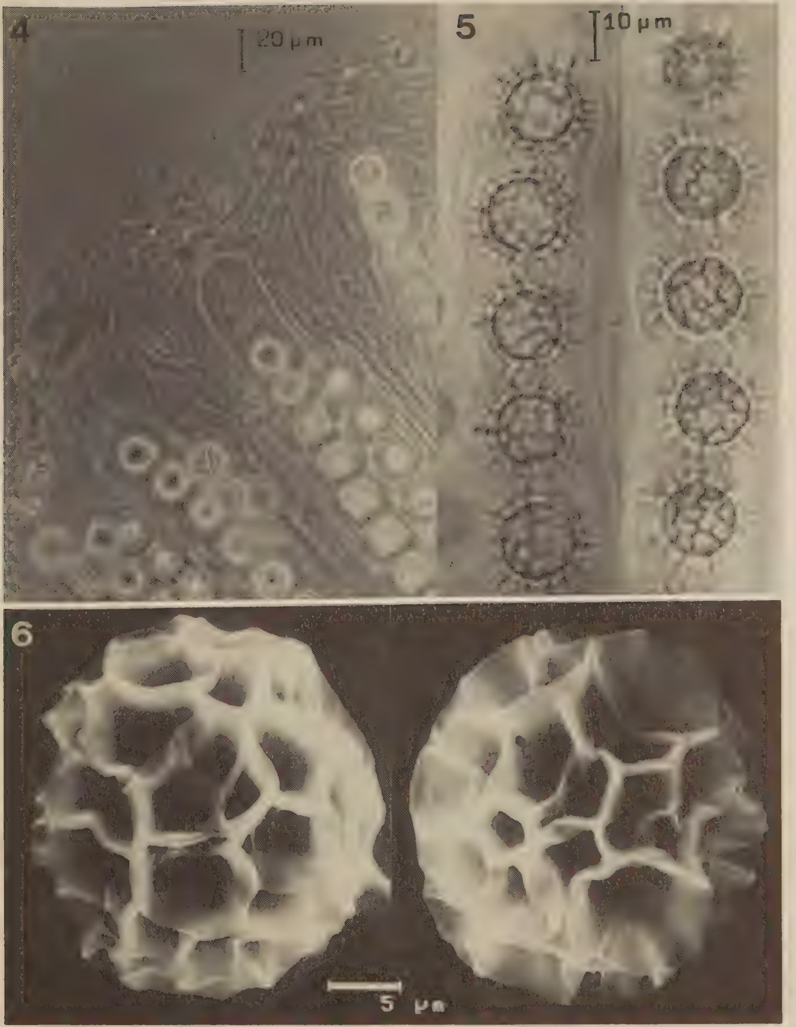
Figs.1-3. ***Ruhlandiella berolinensis***: 1. Habit of apothecia "in situ" (photograph E. Rubio); 2. Fresh brain-like apothecia at high magnification (photograph R. Galán); 3. Section of a subglobose apothecium showing the superficial hymenial layer and the undifferentiated excipulum (photograph R. Galán). A: viewed from above; B: viewed from below; C: in vertical section..

Excipulum ("flesh") of very variable development, with *textura globulosa*, individual cells globose, doliiform, or pyriform, 20-70 µm diam. with somewhat gelatinized walls, hyaline to feebly yellowish. Asci 8-spored, cylindrical, 390-440 x 32-40 µm, with attenuate base arising from a single septum, with strongly dextrinoid content and having thin, amyloid (easy to detect with KOH pre-treatment) walls throughout their whole length, evanescent at maturity. Ascospores biseriate in young asci but finally always uniseriate, globose, one-guttulate, hyaline when immature and becoming dark-yellowish, reticulate, measuring 18-20 µm diam. excluding the ornamentation which reaches 4 µm tall (i.e., averaging 24-28 µm diam. including ornamentation) consisting of ridges forming a reticulum. Paraphyses cylindrical, 10-18 µm wide, with gelatinous walls 4-8 µm wide, pluriseptate, branched, hyaline or golden brown above where they becoming flexuous, exceeding the level of the asci by 50-100 µm to form a continuous pseudoepithecium.

Distribution: According to DISSING & KORF (1980), this erratic species -undoubtedly artificially introduced from Australia where it is associated with its host (*Eucalyptus* spp.)- has been previously recorded from Australia (Tasmania), USA (California), and Macaronesia (Canary Islands). Although the holotype (apparently lost) was found in a German greenhouse, the present findings confirm the presence of the fungus on the European Continent. More recently it has again been recorded from Tasmania (WARCUP & TALBOT, 1989: 98; WARCUP, 1991: 331).

Observations: Macroscopically, it should be noted that ascocarps are not only subglobose to cerebriform as previously reported but also lobate, a feature easily overlooked since the convolute hymenium may obscure this feature.

Also, worthy of mention is how difficult, even in phase-contrast, it is to see the gelatinous sheath around the paraphyses, a feature already mentioned and illustrated by DISSING & KORF (1980). It is easy to misinterpret the paraphyses as "cylindrical-claviform" while we are really seeing the lumina (narrow, sometimes discontinuous and wider above). In addition, we wish to stress how difficult it may be to detect the amyloidity of the wall of the ascus, a feature that is easily overlooked when young asci are observed because of the low contrast with the intense dextrinoid contents. It is easier to notice in mature asci where the weak reaction is noticeable despite the thin walls. Finally, the liberation of the spores is properly not by deliquescence of asci but by progressive invagination of the ascal walls and eventual rupture in such a way that frequently fragments of



Figs. 4-6. ***Ruhlandiella berolinensis***: 4. Detail of the pseudoepithecium above the level of the asci; 5. Mature spores showing the ridges forming a reticulum; 6. Detail of spore ornamentation in SEM.

the ascus walls can be detected surrounding the spores (easily seen in Melzer's reagent as weak blue attached "lines" on the ridges).

Accepting that *Ruhlandiella hesperia* Setchell 1910 is a later synonym of *R. berolinensis* as proposed by SEAVER (1928) and pointed out by DISSING & KORF (1980), it seems to be proven that *Spragueola mucida* Rodway *ss. str. non ss.* Dissing & Korf is a different taxon, characterised by its non-amyloid asci and echinulate spores, being retained as *Sphaerosoma mucidum* (Rodway) Hansford (WARCUP & TALBOT, 1989), a genus currently belonging to Otideaceae (HAWKSWORTH, KIRK, SUTTON & PEGLER, 1995).

On the other hand, according the diagnosis of the genus *Muciturbo* Talbot, and typified by *M. reticulatus* Talbot and looking at the comparative data between *Ruhlandiella berolinensis* and the former (in WARCUP & TALBOT, 1989), we suggest that *Muciturbo* is merely a later synonym of *Ruhlandiella* and also probably that both taxa are conspecific. The larger spore size (26-36 µm, including ornamentation) of the ascospores of *M. reticulatus* is the only feature to distinguish them, as properly noted by WARCUP & TALBOT (1989: 98 "...in mature ascocarps many of these differences, except ascospore size, are not readily apparent"), although they claim smaller spore size (20.5-24.5 µm) than we found in *R. berolinensis* (24-28 µm). It is not clear whether the two other new species proposed in *Muciturbo* (*M. verrucosus* and *M. truncatus*) belong to *Ruhlandiella*.

ACKNOWLEDGEMENTS

The authors express their deep appreciation to Mr. E. Rubio and Mr. A. Suárez, of the Sociedad Micológica de Avilés (Asturias, Spain) for providing fresh material of *Ruhlandiella berolinensis.* We are also grateful to Dr. R. P. Korf (Ithaca, N.Y., USA) for his presubmission review of the manuscript.

REFERENCES

DISSING, H. & R. P. KORF (1980). Preliminary studies in the genera *Ruhlandiella, Sphaerosoma and Sphaerozone* (Order Pezizales). *Mycotaxon* 12:287-306.

HAWKSWORTH, D. L.; KIRK, P. M.; SUTTON, B. C. & PEGLER, D. N. (1995). *Ainsworth & Bisby`s Dictionary of the Fungi*. CAB International, ed. 8, Cambridge.

SEAVER, F. J. (1928). *The North American Cup-Fungi (Operculates).* J. Cramer reprint ,1978.

WARCUP, J. H. (1991). The fungi forming mycorrhizas on eucalypt seedings in regeneration coupes in Tasmania. *Mycol. Res*. 95: 329-332.

WARCUP, J. H. & P. H. B. TALBOT (1989). *Muciturbo*: a new genus of hypogeous ectomycorrhizal Ascomycetes. *Mycol. Res*. 92: 95-100.

MYCOTAXON

Volume LXVIII, pp. 273-292 July-September 1998

INDONESIAN APHYLLOPHORALES 3
POROID AND STEREOID SPECIES FROM KERINCI-SEBLAT NATIONAL PARK, WESTERN SUMATRA

SUHIRMAN
Bogor Botanical Gardens, Jl. Juanda 13, 16122 Bogor, Indonesia.
and
MARIA NÚÑEZ
Department of Botany, Division of Biology, University of Oslo, Blindern,
P.O. box 1045, N-0316 Oslo 3, Norway.

Abstract

Ninety-four species of Aphyllophorales were collected in Kerinci-Seblat National Park, Western Sumatra. Out of these, 33 are new records for Indonesia, and 31 are new for Sumatra. *Henningsia brasiliensis* was found for the first time outside tropical America, and the second world collection of *Polyporus pervadens*. The first records of *Oligoporus subcaesius, Perenniporia japonica* and *P. maackiae* in tropical areas were made. The new combination *Piloporia albomarginata* is proposed.

This is the third paper of a series dedicated to study the biodiversity of Aphyllophorales in Indonesia (Suhirman & Núñez 1995, Suhirman & Núñez 1997).

DESCRIPTION OF THE AREA

Kerinci-Seblat National Park, the largest conservation area in Sumatra (14.847 sq. km) is located in the Barisan mountain range, among the boundary of Sumatra Barat, Jambi, Bengkulu, and Sumatra Selatan provinces in Western Sumatra (Fig. 1). Altitude ranges from 20 to 2447 m.o.s.l., rainfall is about 3000 mm per year. Jacobs (1958) and Ohsawa et al. (1985) have studied the vegetation of the area.

Kerinci-Seblat supports a population of about 273.000 people with an annual growth rate of 3.6 % (Collins et al. 1991). The buffer zone around the National Park consists of 500 sq. km of deforested land, with a continuous displace of the remaining forest by agricultural land. Regional authorities in Jambi province have long planned to construct a road through the National Park with the purpose to link the cities of Jambi and Bengkulu. In October

1995, the area was the epicentre of a strong earthquake (8 in Ritcher´s scale) that destroyed numerous villages, forests, and agricultural land. Besides, extensive fires during the dry year of 1997 have depleted much of the forested areas of the island, including western Sumatra (Anonymous 1998).
The four Indonesian Botanical Gardens (Bogor, Cibodas, Purwodadi, and Bali) launched a botanical expedition to Kerinci-Seblat National Park in 1995, to commemorate the 50th anniversary of Indonesia's independence (Anonymous 1995). Collecting was carried out at the end of the rainy season (25. May – 8. June 1995) in four main locations (Fig. 1), where data on latitude, altitude, temperature, and humidity were recorded with a GPS (Geographical Position System) unit, and the dominant forest types were identified. The description of the locations is as follows:

1. **Sungai Majunto** (Majunto river)
Jambi province: 2° 19' 78'' S, 101° 31' 71'' E.
Altitude: 110-1135 m.o.s.l., temperature 18.5-26 °C, humidity 69-95%.
Secondary forest, with highest relative density of *Urophyllom glabrum* Roxb., *Calophyllum pulcherrimum* Wall., *Platea excelsa* Blume, and *Acronychia laurifolia* Blume. Dominant canopy species are *Polyalthia hypoleuca* Hook. & Thoms., *Alseodaphne macrophylla* Boerl., *Bischofia javanica* Blume, *Garcinia dioica* Blume, and *Turpinia sphaerocarpa* Hassk.

2. **Bukit Parkeh** (Parkeh hill)
Jambi province: 2° 21' 44'' S, 101° 29' 75'' E.
Altitude: 1050-1065 m.o.s.l., temperature 24-25 °C, humidity 85-95%.
Old-grown forest with highest relative density of *Cinnamomum porrectum* (Roxb.) Kosterm., *Weinmania blumei* (Roxb.) Kosterm., *Acmena acuminatissima* (Blume) Merrill & Perry, and *Xanthophyllum flavescens* Roxb. Dominant canopy species are *Cinnamomum porrectum* (Roxb.) Kosterm., *Weinmania blumei* (Roxb.) Kosterm., *Endospermum malaccense* Muell., *Horsfieldia irya* Warb., and *Acmena acuminatissima* (Blume) Merrill & Perry.

3. **Sungai Riang** (Riang river)
Bengkulu province : 2° 24' 11'' S, 101° 26' 54'' E.
Altitude 350-480 m.o.s.l., temperature 25-28 °C, humidity 85-92%.
Highest relative density of *Alseodaphne macrophylla* Boerl., *Polyathia rumphii* Merrill, *Macaranga triloba* Muell., *Phoebe macrocarpa* C.Y. Wu, and *Myristica montana* Wall. Dominant canopy species are *Aglaia ganggo* Miq., *Koompassia excelsa* Taub., *Elaeocarpus glaber* Blume, *Diospyros maingayi* (Hiern.) Bakh., and *Campnosperma auriculata* Hook.

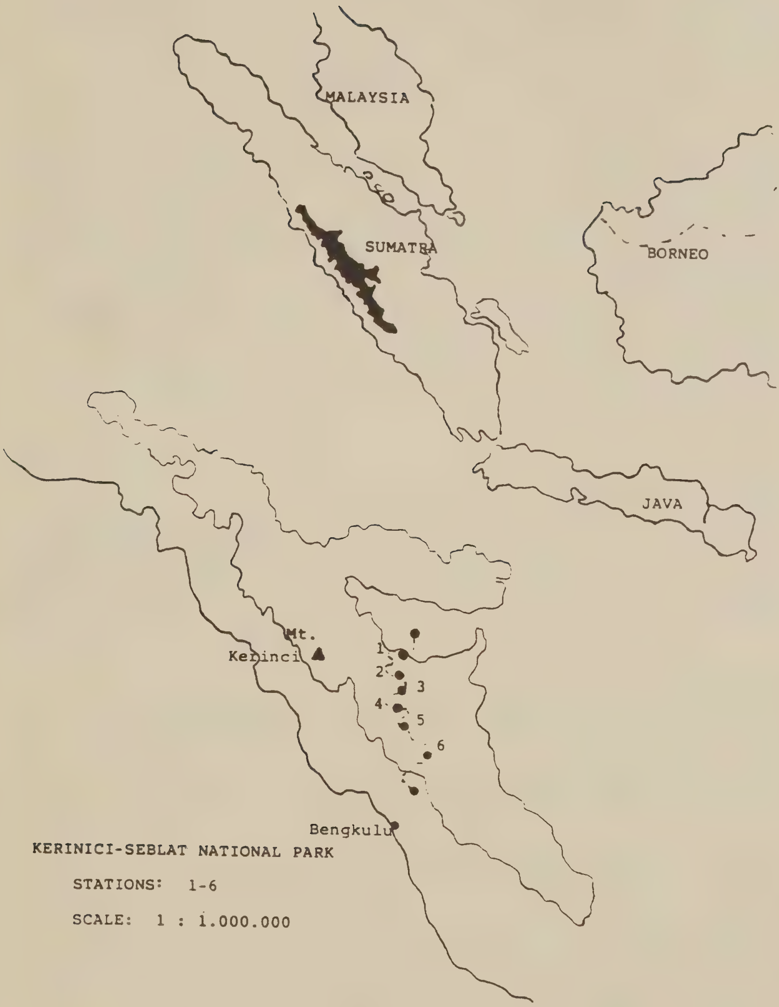

MALAYSIA
SUMATRA
BORNEO
JAVA
Mt. Kerinci
1
2
3
4
5
6
Bengkulu
KERINICI-SEBLAT NATIONAL PARK
STATIONS: 1-6
SCALE: 1 : 1.000.000

Fig. 1. Location of Kerinci-Seblat National Park. Collecting locations for fungi (1-4) are marked on the map.

4. Sungai Larat (Larat creek)
Bengkulu province: position undetected by GPS, altitude 490-520 m.o.s.l., temperature 25-28 °C, humidity 83-92%. No ecological studies were carried out in this location. Dominant plant families were Dipterocarpaceae, Rubiaceae, Annonaceae, Myrtaceae, and Bombacaceae.

Basidiocarps were collected in paper bags by opportunistic sampling on fallen, unidentified wood. Collections were dried under the sun and identified in the field when possible. They were taken to Bogor Botanical Garden and oven-dried at 50°C overnight. Unidentified basidiocarps were observed with a light microscope provided with phase contrast, the tissue mounted in either 5% KOH or Melzer´s reagent (Gilbertson & Ryvarden 1986). We sampled only one voucher collection per species in most of the cases; additional records of the same species were only visual. Voucher collections were deposited in the herbarium at Bogor Botanical Gardens, with duplicates at Oslo herbarium (O).

RESULTS

Species have been grouped in families and then listed alphabetically. The collection number for the specimens at **O** is specified between parenthesis under each species name. A reference to the species description and a note on their global distribution are included. New species for Indonesia are marked with an asterisk (*).

CORTICIACEAE

Erythromyces crocicreas (Berk.) Hjortstam & Ryvarden
Sungai Majunto (MN787), Bukit Parkeh, Sungai Riang, Sungai Larat.
Hjortstam & Tellería (1990).
Distribution: Tropical and subtropical Australasia. New for Sumatra.

Grammothele fuligo (Berk. & Broome) Ryvarden
Sungai Riang (MN865B).
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

* ***Grammothele lineata*** Berk. & M.A. Curtis
Sungai Riang (MN865).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Hymenogramme javanensis Mont. & Berk.
Sungai Majunto (MN765).

Ryvarden & Johansen (1980).
Distribution: Described from Java and later found in the Philippines. Our record is the second one for Indonesia and the first one for Sumatra.

Schizopora flavipora (Cooke) Ryvarden
Sungai Riang (MN883).
Gilbertson & Ryvarden (1987).
Distribution: Cosmopolitan.

Schizopora paradoxa (Fr.) Donk
Sungai Majunto, Sungai Riang, Bukit Parkeh (MN836), Sungai Larat.
Hallenberg (1983).
Distribution: Cosmopolitan.

* ***Theleporus calcicolor*** (Sacc. & Syd.) Ryvarden
Sungai Riang (MN875).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

GANODERMATACEAE
* ***Amauroderma bataanense*** Murrill
Sungai Larat (MN902).
Furtado (1981).
Distribution: Tropical Asia.

Amauroderma rugosum (Blume & Nees:Fr.) Torr.
Sungai Majunto (MN785).
Furtado (1981).
Distribution: Paleotropical, extending to subtropical East Asia. New for Sumatra.

Ganoderma australe (Fr.) Pat.
Sungai Majunto (MN778).
Ryvarden & Johansen (1980).
Distribution: Cosmopolitan, most common in tropical areas.

Ganoderma lucidum s.l. (Fr.) P. Karst.
Sungai Majunto (MN763).
Ryvarden & Johansen (1980).
Distribution: Cosmopolitan.

Ganoderma mastosporum (Lév.) Pat.
Sungai Majunto (MN801).
Aoshima (1971).
Distribution: Pantropical. New for Sumatra.

* ***Ganoderma resinaceum*** Boud. apud Pat.
Sungai Majunto (MN780).
Steyaert (1972).
Distribution: Mainly tropical distribution, also known from West Europe and North America.

HYMENOCHAETACEAE
* ***Aurificaria poncei*** (Lloyd) D.A. Reid
Sungai Riang (MN885).
Reid (1963).
Distribution: South East Asia.

Coltricia spathulata (Hook.) Murrill
Sungai Majunto (MN803B).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Cyclomyces fuscus Fr.
Bukit Parkeh (MN821), Sungai Riang.
Ryvarden & Johansen (1980).
Distribution: Madagascar, Mauritius, and tropical and warm-temperate East Asia.

Cyclomyces setiporus (Berk.) Pat.
Sungai Majunto (MN790).
Ryvarden & Johansen (1980).
Distribution: Australasia. New for Sumatra.

Cyclomyces tabacinus (Mont.) Pat.
Sungai Majunto (MN755).
Ryvarden & Johansen (1980).
Distribution: Pantropical, extending to subtropical Asia.

Phellinus allardii (Bres.) Ryvarden
Sungai Riang (MN889).
Ryvarden & Johansen (1980).
Distribution: Paleotropical. New for Sumatra.

Phellinus* cf. *appositus (Lév.) Pat.
Sungai Majunto (MN808).
Ryvarden & Johansen (1980).
Distribution: Indonesia.
Remarks: Our collection from Kerinci-Seblat fits well with the species description in Ryvarden & Johansen (op. cit.), but has smaller hymenial setae (25-35 x 15 µm) than those given for the type (30-45 x 11-15 µm); they are usually uncinate at their apex, whist they are straight in the type. We keep our collection under this name until more material other than the type is available.

Phellinus caryophillii (Racib.) Ryvarden
Bukit Parkeh (MN824).
Ryvarden & Johansen (1980).
Distribution: Australasia. New for Sumatra.

Phellinus discipes (Berk.) Ryvarden
Bukit Parkeh (MN831).
Ryvarden & Johansen (1980).
Distribution: Tropical Africa, Asia and Australia.

Phellinus gilvus (Schwein.) Pat.
Sungai Majunto (MN797), Sungai Riang, Sungai Larat.
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

Phellinus glaucescens (Petch) Ryvarden
Sungai Riang (MN871).
Ryvarden & Johansen (1980).
Distribution: Paleotropical. New for Sumatra.
Remarks: Our collection had shorter basidiospores (3 µm in diameter) than described for the species (3.5-4.5 x 3-4 µm).

Phellinus lamaensis (Murrill) R. Heim
Sungai Majunto, Bukit Parkeh, Sungai Riang (MN879).
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

* ***Phellinus luctuosus*** (Ces.) Ryvarden
Sungai Majunto (MN789).
Ryvarden & Johansen (1980).
Distribution: South East Asia.

Phellinus pectinatus (Klotz) Quél.
Bukit Parkeh (MN829).
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

Phellinus portoricensis (Overh.) O. Fidalgo
Sungai Majunto (MN804).
Ryvarden & Johansen (1980).
Distribution: Mainly distributed in Central America; this is the second record of the species for Asia with the other from Java (Larsen & Cobb-Poulle, 1990). New for Sumatra.

Phellinus rhabarbarinus (Berk.) G. Cunn.
Sungai Riang (MN856).
Ryvarden & Johansen (1980).
Distribution: South America and South East Asia. New for Sumatra.

* ***Phellinus robustus*** (P. Karst.) Bourdot & Galzin
Bukit Parkeh (MN846).
Ryvarden & Johansen (1980).
Distribution: Cosmopolitan.
Remarks: According to Ryvarden & Johansen (op. cit.), the presence of setae is variable, mostly scarce to absent. Our specimen had abundant setae, 25-30 μm long.

* ***Phellinus umbrinellus*** (Bres.) Ryvarden
Bukit Parkeh (MN820).
Ryvarden & Johansen (1980).
Distribution: Pantropical.
Remarks: Several resupinate *Phellinus* species have been described with 4-6 pores per mm, no setae, and small, coloured basidiospores about 3.5-4.5 x 3 μm (Larsen & Cobb-Poulle, 1990). It may be that some of these taxa represent different development stages of the same species.

Phylloporia chrysita (Berk.) Ryvarden
Sungai Majunto (MN805).
Ryvarden & Johansen (1980).
Distribution: Tropical and subtropical America and Asia. New for Sumatra.

POLYPORACEAE

Antrodiella liebmannii (Fr.) Ryvarden
Sungai Majunto (MN803), Sungai Riang (MN849).

Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

* ***Antrodiella straminea*** (Bres.) Ryvarden & I. Johans.
Sungai Riang (MN850), Sungai Larat (MN899).
Ryvarden & Johansen (1980).
Distribution: Pantropical.
Remarks: We have observed that its cream-coloured hymenophore with minute pores becomes brown when touched.

* ***Ceriporia alachuana*** (Murrill) Hallenb.
Sungai Majunto (MN771).
Gilbertson & Ryvarden (1986).
Distribution: Tropical to warm-temperate America and Asia; there are two records from Europe (Ryvarden & Gilbertson 1993).

* ***Ceriporia viridans*** (Berk. & Broome) Donk
Sungai Riang (MN852, MN893).
Gilbertson & Ryvarden (1986).
Distribution: Cosmopolitan.

* ***Ceriporiopsis mucida*** (Pers.) Gilb. & Ryvarden
Bukit Parkeh (MN827), Sungai Riang (MN881).
Gilbertson & Ryvarden (1986).
Distribution: Cosmopolitan.

* ***Chaetoporellus laetitans*** (Bourdot & Galzin) Bondartsev & Singer
Sungai Riang (MN851).
Ryvarden & Johansen (1980).
Distribution: Cosmopolitan.

Coriolopsis sanguinaria (Klotz) Ryvarden
Sungai Majunto (MN812).
Ryvarden & Johansen (1980).
Distribution: Pantropical, most common in the Paleotropics. New for Sumatra.

* ***Coriolopsis telfarii*** (Klotz) Ryvarden
Sungai Larat (MN900).
Ryvarden & Johansen (1980).
Distribution: Paleotropical.

* ***Daedalea incana*** (Lév.) Ryvarden
Bukit Parkeh (MN828).
Ryvarden & Johansen (1980), as *Trametes.*
Distribution: Tropical and subtropical East Asia.

Dictyopanus pusillus (Lév.) Singer
Sungai Majunto (MN774).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Earliella scabrosa (Pers.) Gilb. & Ryvarden
Sungai Riang (MN854), Sungai Larat (MN901).
Gilbertson & Ryvarden (1986).
Distribution: Tropical to subtropical.

* ***Echinochaete russiceps*** (Berk. & Broome) D.A. Reid
Bukit Parkeh (MN838).
Ryvarden & Johansen (1980).
Distribution: Pantropical, most common in Asia.

Fomitopsis dochmius (Berk. & Broome) Ryvarden
Bukit Parkeh (MN822).
Ryvarden & Johansen (1980).
Distribution: Tropical America, Asia, and Australia.

Fomitopsis rodophaea (Lév.) Imazeki
Bukit Parkeh (MN842).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

* ***Henningsia brasiliensis*** (Speg.) Speg.
Sungai Majunto (MN766).
Núñez (1994).
Distribution: Pantropical. This is the first record of the species outside the neotropics.

Hexagonia tenuis (Hook.) Fr.
Sungai Riang (MN884).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Laetiporus sulphureus (Fr.) Murrill
Bukit Parkeh (MN835).
Ryvarden & Johansen (1980).
Distribution: Cosmopolitan, most common in temperate areas. New for Sumatra.

Lenzites elegans (Fr.) Pat.
Sungai Majunto (MN798).
Ryvarden & Johansen (1980).
Distribution: Tropical to subtropical.

Loweporus fuscopurpureus (Pers.) Ryvarden
Bukit Parkeh (MN830, MN841).
Ryvarden & Johansen (1980).
Distribution: Pantropical, extending to subtropical Asia. New for Sumatra.

* ***Loweporus inflexibilis*** (Berk.) Ryvarden
Sungai Riang (MN891).
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Loweporus roseo-albus (Jungh.) Ryvarden
Sungai Majunto (MN786).
Ryvarden & Johansen (1980).
Distribution: Paleotropical. New for Sumatra.

Megasporoporia cavernulosa (Berk.) Ryvarden
Sungai Riang (MN895).
Ryvarden & Johansen (1980).
Distribution: pantropical, extending to warm-temperate America and Asia. New for Sumatra.

Megasporoporia setulosa (Henn.) Ryvarden & J.E. Wright
Bukit Parkeh (MN818).
Gilbertson & Ryvarden (1987).
Distribution: Pantropical,extending to warm-temperate America and Asia. New for Sumatra.

* ***Microporellus violaceo-cinerascens*** (Petch) A. David & Rajchenb.
Sungai Majunto (MN761).
Ryvarden & Dhanda (1975), as *Cystostiptoporus*.
Distribution: Tropical and subtropical Asia.

Microporus affinis (Blume & Nees :Fr.) Kuntze
Sungai Majunto (MN776), Bukit Parkeh, Sungai Riang (MN855), Sungai Larat.
Ryvarden & Johansen (1980).
Distribution: Paleotropical extending to subtropical and warm-temperate East Asia.

Microporus vernicipes (Berk.) Kuntze
Sungai Majunto (MN796), Sungai Riang (MN887).
Ryvarden & Johansen (1980).
Distribution: Paleotropical extending to subtropical and temperate East Asia. New for Sumatra.

Microporus aff. ***vernicipes***
Bukit Parkeh (MN825).
Remarks: MN825 reminds macroscopically *Microporus vernicipes*, but the basidiospores of the present collection are 4 x 1.5 µm, much smaller than in the latter species (6-7 x 2-2.5 µm, op.cit.).

Microporus xanthopus (Fr.) Kuntze
Sungai Majunto (MN751), Sungai Riang.
Ryvarden & Johansen (1980).
Distribution: Paleotropical.

Microporus aff. ***xanthopus***
Sungai Majunto (MN781).
Remarks: MN781 deviates from typical *M. xanthopus* specimens by its larger pores (6-7 per mm, 8-10 per mm given for the species in Ryvarden & Johansen 1980), a dark purple pileus, and shorter basidiospores (4.5 µm long compared with 6-7.5 µm long). Otherwise basidiocarps were typically glossy, zonate, and infundibuliform with a yellowish stipe, and had a trimitic hyphal system with dendrohyphidia in the dissepiments.

Nigrofomes melanoporus (Mont.) Murrill
Sungai Majunto (MN782), Bukit Parkeh.
Ryvarden & Johansen (1980).
Distribution: Pantropical extending to subtropical America and Asia.

Nigroporus vinosus (Berk.) Murrill
Sungai Riang (MN860), Sungai Larat.
Ryvarden & Johansen (1980).

Distribution: Pantropical extending to subtropical America and Asia.

* ***Oligoporus subcaesius*** (A. David) Ryvarden & Gilb.
Bukit Parkeh (MN832).
Ryvarden & Gilbertson (1994).
Distribution: Temperate. First record of the species for tropical areas.
Remarks: Our specimen had the typical white to greyish, villose pileus that becomes blue when touched (Ryvarden & Gilbertson, op. cit.). *Tyromyces caesioflavus* (Pat.) Ryvarden, a South American species also becoming blue when touched, differs by having a yellowish, glabrous pileus (Ryvarden, 1983).

* ***Pachykytospora alabamae*** (Berk.) Ryvarden
Sungai Majunto (MN777).
Gilbertson & Ryvarden (1987).
Distribution: Paleotropical extending to subtropical America and Asia.

Perenniporia contraria (Berk. & M.A. Curtis) Ryvarden
Sungai Majunto (MN769).
Ryvarden & Johansen (1980).
Distribution: Tropical, but rare.

* ***Perenniporia japonica*** (Yasuda) Hattori & Ryvarden
Sungai Majunto (MN811).
Ryvarden & Gilbertson (1994).
Distribution: Temperate Asia and Europe. First record for tropical areas.

* ***Perenniporia maackiae*** (Bondartsev & Ljub.) Parmasto
Sungai Larat (MN899B).
Dai & Niemelä (1995).
Distribution: Asia. First record for tropical areas.

Perenniporia martius (Berk.) Ryvarden
Bukit Parkeh (MN817).
Ryvarden & Johansen (1980).
Distribution: Pantropical, extending to subtropical and warm-temperate East Asia. New for Sumatra.

Polyporus dictyopus Mont.
Sungai Majunto (MN753), Bukit Parkeh, Sungai Riang, Sungai Larat.
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Polyporus grammocephalus Berk.
Sungai Majunto (MN752).
Núñez & Ryvarden (1995).
Distribution: Pantropical.

* ***Polyporus pervadens*** Corner
Sungai Riang (MN882).
Corner (1984).
Distribution: South East Asia. Second world record of this species, described from Malaysia (op. cit.).
Remarks: *Polyporus pervadens* deviates from others species in the genus by lacking a stipe. Its pileate basidiocarps with pores wider than 1 mm resemble those of *Hexagonia* species (Fig. 2). Basidiocarps developed on rhizomorphs growing about half a meter over the ground on tree trunks. The relation between stipe and rhizomorph development has been discussed by Núñez & Ryvarden (1995).

Polyporus philippinensis Berk.
Sungai Riang (MN886).
Núñez & Ryvarden (1995).
Distribution: Pantropical, more common in the Paleotropics.

Polyporus tenuiculus (P. Beauv.) Fr.
Sungai Riang (MN853).
Núñez & Ryvarden (1995).
Distribution: Pantropical. New for Sumatra.

* ***Polyporus virgatus*** Berk. & M.A. Curtis
Sungai Riang (MN888).
Núñez & Ryvarden (1995).
Distribution: Pantropical.

Pycnoporus sanguineus (L.:Fr.) Murrill
Bukit Parkeh, Sungai Riang (MN861), Sungai Larat.
Ryvarden & Johansen (1980).
Distribution: Pantropical.

Pyrofomes albomarginata (Lév.) Ryvarden
Sungai Majunto (MN758), Sungai Riang.
Ryvarden & Johansen (1980).

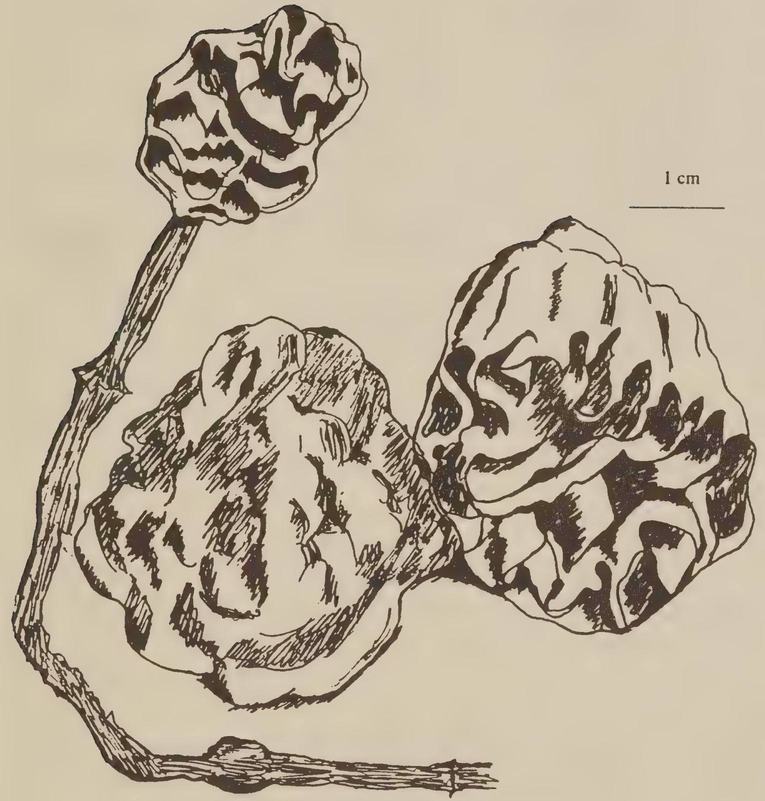


Fig. 2. Basidiocarps of *Polyporus pervadens* Corner.

Distribution: Pantropical, most common in the Paleotropics. New for Sumatra.
Remarks: Ryvarden (1972) combined this species in *Pyrofomes* because of its bright orange context. Although he did not find basidiospores in the type, he concluded that the basidiospores would be as in other *Pyrofomes* species, that is, thick-walled and truncate (Ryvarden & Johansen op. cit.). Later, he described a species of *Piloporia* with an orange context, *P. indica*, with the tiny, allantoid basidiospores and encrusted dissepiments typical for the genus (Ryvarden & Gilbertson 1994). We have seen authorised material of *Pyrofomes albomarginata*, and found tiny, allantoid basidiospores and encrusted dissepiments in all specimens. Thus, we conclude that both *Piloporia indica* and *Pyrofomes albomarginatus* represent the same species. For reasons of priority, the correct name of this taxon is as follows:

***Piloporia albomarginata* (Lév.) Núñez, comb. nov.**
Basionym: *Polyporus albo-marginatus* Lév., Am. Sci. Nat. Ser. 3, vol. 2:191, 1844.

* ***Rigidoporus defibulatus*** (D.A. Reid) Corner
Sungai Majunto (MN802).
Corner (1987).
Distribution: Paleotropical.

* ***Rigidoporus dextrinoideus*** I. Johans. & Ryvarden
Sungai Majunto (MN791).
Ryvarden & Johansen (1980).
Distribution: Paleotropical. First record of this species for Asia.

Rigidoporus microporus (Fr.) Overeem
Sungai Majunto (MN756, MN768, MN783).
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

Rigidoporus vinctus (Berk.) Ryvarden
Sungai Majunto (MN767, MN858), Sungai Riang, Bukit Parkeh.
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.
Remarks: We have found both var. *cinerea* (Bres.) Setliff (MN858) and var. *vinctus* (Bres.) Setliff (MN767) in Kerinci-Seblat.

* ***Skeletocutis lenis*** (P. Karst.) Niemelä
Bukit Parkeh (MN834).

Renvall et al. (1991).
Distribution: Cosmopolitan.
Remarks: For a narrow species concept, see Niemelä & Dai (1997).

Tinctoporellus epimiltinus (Berk. & Broome) Ryvarden
Sungai Riang (MN859), Sungai Larat.
Ryvarden & Johansen (1980).
Distribution: Pantropical. New for Sumatra.

Trametes lactinea (Berk.) Pat.
Sungai Majunto (MN814), Sungai Riang (MN867).
Ryvarden & Johansen (1980).
Distribution: Paleotropical. New for Sumatra.
Remarks: Our specimens were small (up to 5 x 3 cm), compared with the sizes given in Ryvarden & Johansen (op. cit.). This smaller variety has been called *T. orientalis* (Yas.) Imaz. (Hattori & Ryvarden, 1994).

Trametes menziezii (Berk.) Ryvarden
Sungai Majunto (MN813).
Ryvarden & Johansen (1980).
Distribution: Paleotropical.

* ***Trametes pocas*** (Berk.) Ryvarden
Sungai Majunto (MN757), Bukit Parkeh (MN833).
Ryvarden & Johansen (1980), as *Trametes* cf. *villosa*.
Distribution: Paleotropical.

Trichaptum biformis (Fr.) Ryvarden
Sungai Majunto (MN793).
Ryvarden & Johansen (1980).
Distribution: Cosmopolitan.

Trichaptum durum (Jungh.) Corner
Sungai Majunto (MN794), Bukit Parkeh.
Corner (1987).
Distribution: Pantropical to subtropical.

* ***Wrightoporia avellanea*** (Bres.) Pouzar
Sungai Larat (MN904).
Ryvarden & Johansen (1980).
Distribution: Pantropical extending to subtropical America and Asia.

STEREACEAE

Cymatoderma elegans Jungh. var. ***elegans***
Sungai Riang (MN863).
Reid (1965).
Distribution: Pantropical.

* ***Cymatoderma fuscum*** (Cooke) D.A. Reid var. ***fuscum***
Sungai Majunto (MN760, MN799).
Reid (1965).
Distribution: Described from Brazil. First record for the paleotropics.

* ***Podoscypha*** cf. ***bubalina*** D.A. Reid
Sungai Majunto (MN762).
Reid (1965).
Distribution: Described from Brazil. First record for the paleotropics.
Remarks: Our specimens deviate from the species description by having larger basidiocarps (up to 6 cm long, *P. bubalina* up to 2 cm long, op. cit.) and not having an infundibuliform pileus. Otherwise the mycelial disc at the base of the stipe and the microscopic characters are typical.

* ***Podoscypha involuta*** (Klotzsch) Imazeki
Sungai Majunto (MN807).
Reid (1965).
Distribution: Tropical Asia, Africa and Australia. New for Sumatra.

Stereum ostrea (Blume & Nees:Fr.) Fr.
Sungai Majunto (MN775).
Reid (1965).
Distribution: Pantropical.

ACKNOWLEDGEMENTS

We want to thank the organisers and participants in the Kerinci-Seblat expedition for all sort of help including logistics. We are especially grateful to Mrs. Tika, Mr. Cecep, Mr. Tjuk, Mr. Chechep, Mr. Eddy for being a cheering and warm company during the expedition, and to Mr. Didik for providing botanical data of the locations. The Indonesian Institute of Sciences (LIPI) provided financial support. Roy Watling has kindly revised the manuscript for publication.

LITERATURE CITED

Anonymous. 1995. Kebun Raya Indonesia launches an expedition to Sumatra to commemorate the 50th year of Indonesian independence. Eksplorasi 2: 1-2.

Anonymous. 1998. Indonesia's forest holocaust. Plant talk 12: 12.

Aoshima, K. 1971. *Ganoderma* and *Amauroderma* of Polyporaceae. Bull. Tokyo Nat. Sci. Mus. 14: 428-437.

Collins, N.M., Sayer, J.A. & Whitmore, T.C. 1991. The conservation Atlas of tropical forest. Asia and the Pacific. The world Conservation Union. Ed. Simon & Schuster, New York.

Corner, E.J.H. 1984. Ad Polyporaceas II,III. J. Cramer, Stuttgart.

Corner, E.J.H. 1987. Ad Polyporaceas IV. J. Cramer, Stuttgart.

Dai, Y.C. & Niemelä, T. 1995. Changbai wood-rotting fungi 4. Some species described by A.S. Bondartsev and L.V. Lyubarsky from the Russian Far East. Ann. Bot. Fenn. 32: 211-226.

Furtado, J.S. 1981. Taxonomy of *Amauroderma* (Basidiomycetes, Polyporaceae). Mem. N.Y. Bot. Gard. 34: 1-109.

Gilbertson, R.L. & Ryvarden, L. 1986-87. North American polypores. Vol. 1 and 2. Fungiflora, Oslo.

Hallenberg, N. 1983. On the *Schizopora paradoxa* complex (Basidiomycetes). Mycotaxon 18: 303-313.

Hattori, T. & Ryvarden, L. 1994. Type studies in the Polyporaceae 25. Species described from Japan by R. Imazeki and A. Yasuda. Mycotaxon 50: 27-46.

Hjortstam, K. & Tellería, M.T. 1990. *Columnocystis*, a synonym of *Veluticeps*. Mycotaxon 37: 55.

Jacobs, M. 1958. Contribution to the botany of Mount Kerintji and adjacent area in west central Sumatra - I. Anales Bogoriensis 3: 45-104.

Larsen, M.J. & L.A. Cobb-Poulle. 1990. *Phellinus* (Hymenochaetaceae). A survey of the world taxa. Fungiflora, Oslo.

Niemelä, T. & Dai, Y.C. 1997. Polypore *Skeletocutis lenis* and its sib *S. vulgaris*. Ann. Bot. Fennici 34: 133-140.

Núñez, M. 1994. First records of *Henningsia brasiliensis* outside Brazil. Mycologist 8: 175-176.

Núñez, M. & L. Ryvarden. 1995. The genus Polyporus and related genera. Oslo.

Ohsawa, M., Nainggolan, P.H.J., Tanaka, N. & Anwar, C. 1985. Altitudinal zonation of forest vegetation on Mount Kerinci, Sumatra, with comparisons to zonation in the temperate region of East Asia. J. Trop. Ecol. 1: 193-216.

Reid, D.A. 1963. New or interesting records of Australasian basidiomycetes, V. Kew Bull. 17: 267-308.

Reid, D.A. 1965. A monograph of the stipitate stereoid fungi. Beih. Nov. Hedw. 18: 1-382.

Renvall, P., Renvall, T. & Niemelä, T. 1991. Basidiomycetes at the timberline in Lapland 2. An annotated checklist of the polypores of northeastern Finland. Karstenia 31:13-28.

Ryvarden, L. 1972. A critical checklist of the Polyporaceae in tropical East Africa. Norw. J. Bot. 19: 229-238.

Ryvarden, L. & Dhanda, R.S. 1975. Two remarkable polypores from India. Trans. Br. Mycol. Soc. 65: 413-417.

Ryvarden, L. & Gilbertson, R.L. 1993-94. European polypores. Vol. 1 & 2. Fungiflora, Oslo.

Ryvarden, L. & Johansen, I. 1980. A preliminary polypore flora of East Africa. Fungiflora, Oslo.

Steyaert, R.L. 1972. Species of *Ganoderma* and related genera mainly of the Bogor and Leiden herbaria. Persoonia 7: 55-118.

Suhirman & Núñez, M. 1995. Indonesian Aphyllophorales I. A literature survey. Bull. Kebun Raya Indonesia 8: 69-78.

Suhirman & Núñez, M. 1997. Indonesian Aphyllophorales II. Species of Polyporaceae in the Herbarium Bogoriensis. Bull. Kebun Raya Indonesia 9 (in press).

MYCOTAXON

Volume LXVIII, pp. 293-298 July-September 1998

OIDIUM SP. (ERYSIPHACEAE) ON CASSIA SENNA, A FUNGUS NEW TO THE MYCOTA OF EUROPE

TADEUSZ MADEJ AND JANUSZ BŁASZKOWSKI

Department of Plant Pathology, Academy of Agriculture,
Słowackiego 17, PL–71434 Szczecin, Poland

Abstract

Oidium sp. affecting leaves of *Cassia senna* growing in the Botanical Garden Berlin–Dahlem is characterized and illustrated. Morphological features of conidia and conidiophores, as well as the host plant suggest the *Oidium* sp. found to be a mitomorphic state of *Sphaerotheca cassiae*. This paper is the first record of the occurrence of a powdery mildew fungus on *Cassia senna* in Europe.

Key Words: *Cassia senna*, Erysiphales, *Oidium* sp., powdery mildew

Introduction

Plants of the genus *Cassia* (=*Senna*) originate from tropical areas, hence their occurrence in temperate regions is usually limited to greenhouses of botanical gardens.

Among phytopathogenic fungi mentioned in the literature to be associated with plants of the genus *Cassia*, there are biotrophic species of the order Erysiphales, including *Erysiphe polygoni* DC.–1805, *Microsphaera diffusa* f. *diffusa* Cooke & Peck–1872, *M. penicillata* (Wallr.: Fr.) Lév.–1851, *Oidium cassiae–hirsutae* Yen–1966, *O. cassiae–siameae* Yen–1967, *Oidium* sp., *Ovulariopsis* sp., *Phyllactinia dalbergiae* Pirozynski–1965, and *Sphaerotheca cassiae* Pandora & Ganguly–1964 found in the U. S. A., Central and South America, and in Asia (Braun, 1987; Farr *et al.*, 1989; Harsh *et al.*, 1992; Kothari and Bhatnagar, 1971; Sanabria–de–Albarracin and Albarracin, 1988). However, there is no report of the occurrence of members of the order Erysiphales on plants of the genus *Cassia* from Europe (Braun, 1987; Braun, pers. comm.).

During a visit in the Botanical Garden Berlin–Dahlem (Germany), leaves of *Cassia senna* L. (=*Senna alexandria* Mill.) severely infected by a fungus of the genus *Oidium* has been found. This pathogen is described, illustrated and discussed in the present paper.

Material and Methods

Leaves of *Cassia senna* infected with a powdery mildew fungus were collected in a greenhouse of the Botanical Garden in Berlin–Dahlem (Germany) on September 12, 1997. The leaves came from one shrub, *ca* 2.5 m high. Morphological features of the powdery mildew fungus were determined based on hyphae, conidiophores and conidia mounted in either pure lactic acid or lactic acid stained with aniline blue. All observations and measurements were made by means of light microscopy. Conidium and conidiophore characteristics and terminology used in this paper are those suggested by Braun (1987) and Shin and La (1993). Voucher specimens of the fungus characterized are deposited in the Department of Plant Pathology (DPP), Academy of Agriculture, Szczecin, Poland.

Description and Discussion

Oidium sp.

Fig. 1.

Mycelium occurring on the upper site of leaves more abundant than that present on the lower surface of leaves; occurring in patches or evenly covering the leaf surface.

Mycelium white, loose, gossamery when young, becoming gray and more compact to tomentous with age.

Hyphae hyaline, straight to battered, sometimes tortuous, consisting of many cells, (3–)4–5.5(–6.5) µm wide.

Appressoria numerous, nipple–shaped, nipple–shaped with a crenulate margin, sometimes slightly nipple–shaped or indistinct.

Conidiophores straight, cylindric, (30–40–)80–120(–170) x (7–)8–10(–12) µm; foot cells one–celled, straight or more or less recurvate, cylindric, (38–)47–86(–94) x (7–)8–10(–12) µm, followed by (1–)2(–3) cylindric cells, each (7–)8–12(–18) µm long.

Conidia broadly ellipsoid, ellipsoid, ellipsoid–cylindric to barrel–shaped, arranged in chains, (18–)20–28(–32) x (10–)12–16(–18) µm, with fibrosin bodies; usually three conidia per chain.

Germ tubes ca 2 µm wide, appearing either at the base or top of a conidium, terminating in an appressorium.

Haustoria spherical to ellipsoid, (6–)8–12 µm wide.

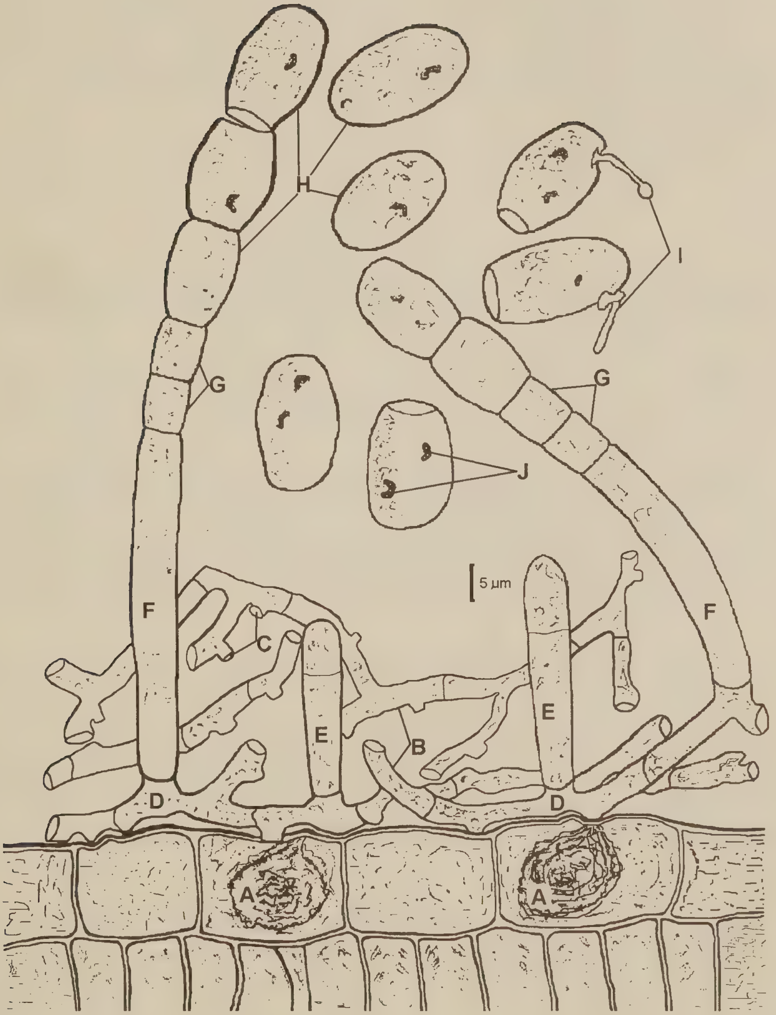
COLLECTION EXAMINED. GERMANY. Berlin–Dahlem, on leaves of *Cassia senna* L. growing in a greenhouse of the

Botanical Garden, 12 Sept. 1997, *Błaszkowski, J., 2174–2181* (DPP).

No meiomorphic state of the powdery mildew fungus characterized here has been found, but the morphological features of its conidia and conidiophores, as well as the crenate edge line of chained conidia, which agree with the data given by Braun (1987) and Shin and La (1993), suggest the *Oidium* sp. found to be a mitomorphic state of *Sphaerotheca cassiae*.

Based on literature data (Braun, 1987; Farr *et al.*, 1989; Harsh *et al.*, 1992; Kothari and Bhatnagar, 1971; Sanabria–de–Albarracin and Albarracin, 1988) and the information kindly provided by Dr. U. Braun, it can be stated that the present collection represents the first European record of a powdery mildew on *Cassia senna*.

Fig. **1.** Cross–sectional view of a leaf infected by Oidium sp. **A**–haustoria, **B**–mycelium, **C**–appressoria, **D**–branched cell of mycelium, **E**–young foot cell, **F**–mature foot cell, **G**–generative cells, **H**–conidia, **I**–germinated conidia with appressoria, **J**–fibrosin bodies.


H
I
G
G
J
5 µm
F
C
F
E
E
B
D
D
A
A

Acknowledgment

We would like to thank Dr. U. Braun, Martin–Luther–Universität, F. B. Biologie, Institut für Geobotanik und Botanischer Garten, Halle/S, Germany, for providing data on the occurrence of powdery mildew fungi on *Cassia* sp. and valuable comments on the manuscript.

Literature cited

Braun, U. 1987. A monograph of the Erysiphales (powdery mildews). Beih. Nova Hedwigia 89: 1–700.

Farr, D. F., G. F. Bills, G. P. Chamuris, and A. Y. Rossman. 1989. Fungi on plants and plant products in the United States. APS Press. Amer. Phytopath. Soc. St. Paul, Minnesota USA.

Harsh, N. S. K., C. K. Tiwari, and V. Nath. 1992. Some powdery mildews from Madhya Pradesh. J. Trop. For. 8: 173–178.

Kothari, K. L., and M. K. Bhatnagar. 1971. Two new hosts of powdery mildews *Cassia sophera, Rumex dentatus.* Indian Phytopathol. 24: 188.

Sanabria–de–Albarracin, N., and N. S. Albarracin. 1988. Fungi causing powdery mildew on ornamental plants from the central region of Venezuela. Fitopatol. Ven. 1: 59–64.

Shin, H., and Y. La. 1993. Morphology of edge lines of chained immature conidia on conidiophores in powdery mildews and their taxonomic significance. Mycotaxon 46: 445–451.

MYCOTAXON
Volume LXVIII, pp. 299-310 July-September 1998

CERCOSPOROID FUNGI FROM BRAZIL. 2.

PEDRO W. CROUS
Department of Plant Pathology, University of Stellenbosch,
P. Bag X1, Matieland 7602, South Africa

MARCOS P.S. CÂMARA
Department of Plant Pathology, The Pennsylvania State
University, Buckhout Lab., University Park, PA 16802, USA

ABSTRACT

This contribution deals with the systematics of cercosporoid fungi from Brazil. Four *Cercospora* species from Brazil, and one from the USA are treated. New combinations and names are proposed in *Passalora*, *Phaeoramularia* and *Pseudocercospora*.

INTRODUCTION

In his monograph of the genus *Cercospora*, Chupp (1954) listed several *Cercospora* spp. that were described from Brazil by Viégas (1945). In recent years, however, the concept of *Cercospora* has been re-evaluated, and nearly 50 segregate genera distinguished from *Cercospora sensu lato* based on a combination of factors including their conidium and conidiophore morphology, pigmentation, type of conidioma, presence or absence of superficial mycelium, and nature of the conidial hila and abscision scars on the conidiogenous cells (Braun, 1995).

Subsequent to Chupp (1954), several workers have treated some cercosporoid fungi from Brazil (Dianese, Sutton & Tessman, 1993; Dianese & Câmara, 1994; Medeiros & Dianese, 1994; Barreto & Evans, 1995; Crous & Alfenas, 1995). Recently, more attention has been given to the systematic revision of the Brazilian cercosporoids (Inácio *et al.*, 1996; Crous *et al.*, 1997). The present study gives an account of four Brazilian and one North American species that are lodged at the National USDA Herbarium, Beltsville Maryland, USA (BPI).

SPECIES TREATED

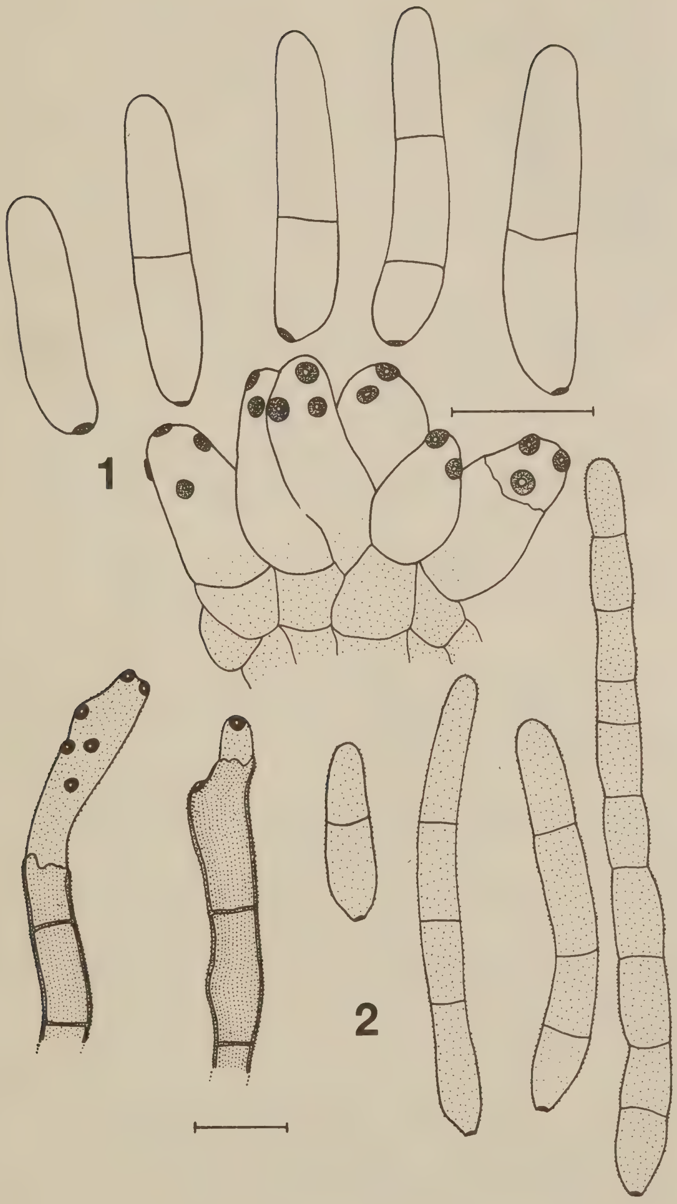
1. *Passalora urostigmatis* (Henn.) Crous & M.P.S. Câmara comb. nov. Fig. 1

Cercospora urostigmatis Henn., *Hedwigia* **41**: 117. 1902.

Leaf spots amphigenous, circular, 2-10 mm diam., dark brown on adaxial surface, with a sunken appearance and inconspicuous border. *Mycelium* predominantly internal, composed of smooth, branched, hyaline hyphae, 2-3 µm diam. *Caespituli* fasciculate, hypophyllous, pale brown on leaves, up to 80 µm wide and 40 µm high. *Conidiophores* mostly reduced to conidiogenous cells, or 1-septate, aggregated in dense fascicles, arising from the upper cells of a minute light brown stroma; conidiophores subhyaline to pale olivaceous at the base, finely verruculose, subcylindrical to obclavate, straight to slightly curved, unbranched, sometimes rejuvenating enteroblastically, tapering to obtuse apices, with several thickened, slightly darkened, refractive apical loci, proliferating sympodially, 10-25 x 5-7 µm. *Conidia* solitary, subhyaline to pale olivaceous, smooth, subcylindrical, apex obtuse, base obconic, straight to slightly curved, 0-1(-3)-septate, (11-)17-25(-35) x (3-)4-5(-5.5) µm; hila slightly thickened, darkened throughout, refractive.

Specimen: Brazil, São Paulo, Serra da Cantareira, on leaves of *Urostigma* sp. (Moraceae), A. Puttemans, 3 Apr. 1901, A. Puttemans Fungi S. Paulensis 187, BPI 442107 (holotype).

Figs. 1, 2. Conidia and conidiophores of (1) *Passalora urostigmatis* (BPI 442107), and (2) *Passalora cordylines* (BPI 435225). Bars = 10 µm.


1
2

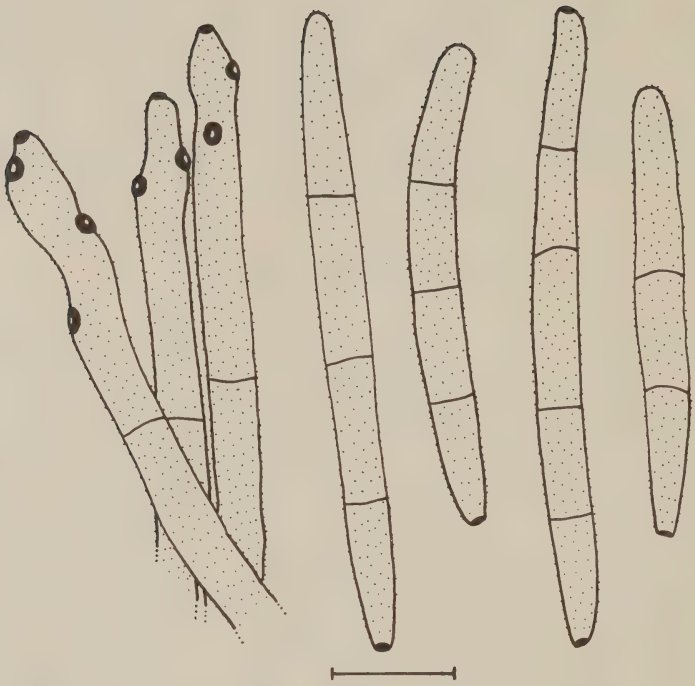


Fig. 3. Conidia and conidiophores of *Phaeoramularia adenocalymmae* (BPI 432404). Bar = 10 µm.

In his treatment of *Cercosporella* and segregate genera, Braun (1995) lists a single species from Moraceae, namely *C. antiaridis* Hansf. The latter species is quite distinct from *P. urostigmatis* by having different conidial hila, divergent fascicles with longer conidiophores (up to 150 µm), and larger (40-130 x 4-6 µm), 1-6-septate conidia. Chupp (1954) also records *P. urostigmatis* (as *Cercospora urostigmatis*) from Venezuela, and it is possible that it has a wider distribution in South America.

2. *Passalora cordylines* (Henn.) Crous & M.P.S. Câmara comb. nov. Fig. 2

Cercospora cordylines Henn., *Hedwigia* **41**: 117. 1902.
Cercospora cordylines Speg., *Rev. Mus. La Plata* **15**: 45. 1908.

Leaf spots amphigenous, circular, 2-8 mm diam., brown to dark red-brown, with a dark brown to black border; frequently coalescing into larger spots. *Mycelium* internal, composed of smooth to finely verruculose, branched, light brown hyphae, 3-4 µm diam. *Caespituli* fasciculate, amphigenous, dark brown on leaves, up to 120 µm wide. *Conidiophores* densely aggregated, arising from the upper cells of a brown stroma; conidiophores medium brown, finely verruculose to verruculose, subcylindrical, straight to geniculate-sinuous, unbranched, 1-7-septate, 30-75 x 3-5 µm. *Conidiogenous cells* integrated, terminal, unbranched, light brown, finely verruculose, subcylindrical, tapering to rounded apices, with several thickened, darkened, refractive apical loci, proliferating sympodially, and frequently rejuvenating enteroblastically, 5-30 x 4-4.5 µm. *Conidia* solitary, medium brown, finely verruculose, subcylindrical to obclavate, apex obtuse, base obconically truncate, straight to curved, (1-)3-8(-10)-septate, frequently constricted at septa, (25-)45-75(-100) x (4-)5-6 µm; hila slightly thickened, darkened, refractive (Chupp lists some conidia to be up to 175 µm in length).

Specimen: Brazil, São Paulo, Botanic Garden, *Cordyline dracenoides* (Agavaceae), A. Puttemans, Mar. 1901, A. Puttemans Fungi S. Paulensis 286, BPI 435225 (holotype).

Passalora cordylines (Henn.) Crous & M.P.S. Câmara and its later homonym, *Cercospora cordylines* Speg. were both collected from the same location, and represent the same fungus *fide* Chupp (1954).

3. *Phaeoramularia adenocalymmae* (A.S. Mull. & Chupp) Crous & M.P.S. Câmara comb. nov. Fig. 3

Cercospora adenocalymmae A.S. Mull. & Chupp, *Arq. do Inst. de Biol. Vegetal* **1**: 213. 1935.

Leaf spots amphigenous, sub-circular, 0.5-4 mm diam., grey on adaxial surface, surrounded by a raised, dark brown border, and a thin, red-purple margin. *Mycelium* internal, composed of smooth to finely verruculose, branched, light brown hyphae, 3-4 µm diam. *Caespituli* fasciculate, predominantly hypophyllous, brown, up to 130 µm wide and 100 µm high. *Conidiophores* aggregated in dense fascicles, arising from the upper cells of a brown stroma; conidiophores light brown, finely verruculose, subcylindrical, straight to slightly curved, unbranched, 1-5-septate, 25-75 x 4-5 µm. *Conidiogenous cells* terminal, unbranched, light brown, finely verruculose, tapering to flat-tipped, thickened, refractive apical loci, proliferating sympodially, 10-35 x 4-4.5 µm. *Conidia* rarely catenulate, chains simple, finely verruculose, light brown, cylindro-obclavate, apex obtuse, base long obconically truncate, straight to slightly curved, (1-)3-8(-10)-septate, (30-)50-100(-150) x 3.5-4(-4.5) µm; hila thickened, darkened, refractive.

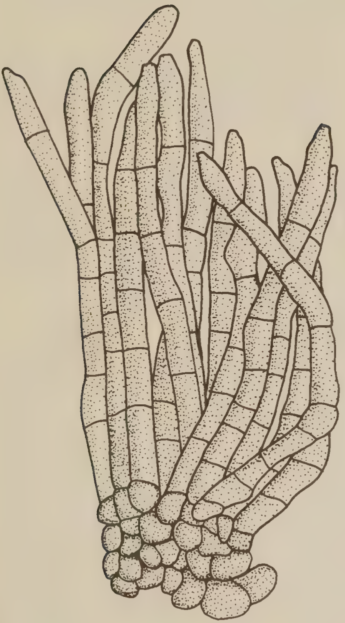
Specimen: Brazil, Espirito Santo, Vargem Alta, *Adenocalymma bracteatum* (Bignoniaceae), S. C. da Silva, 18 Aug. 1938, Herb. Phytopathol. Serv. Def. San. Vegetal Est. ES, No. 322, BPI 432404.

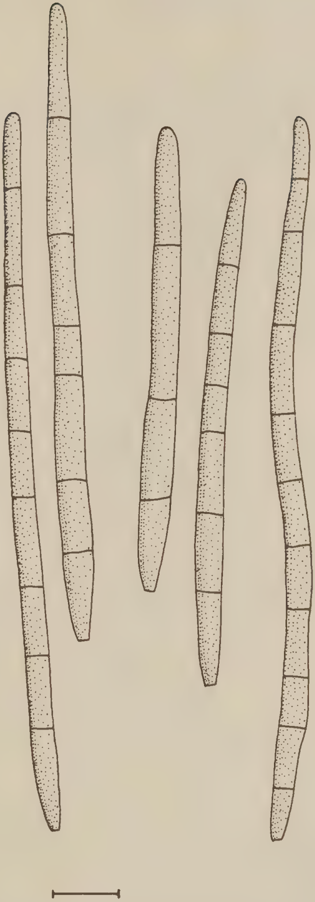
Chupp (1954) reports this species from two states in Brazil, namely Espirito Santo and Minas Gerais. Although the type was not located in the present study, the specimen examined was annotated by Chupp as *Cercospora adenocalymmae* A.S. Mull. & Chupp, and closely fits his description of this species.

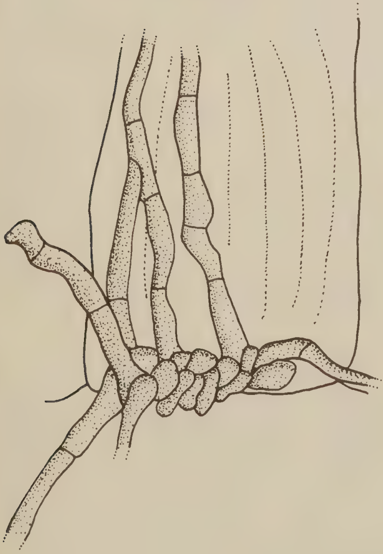
4. *Pseudocercospora richardsoniae* (Ellis & Everh.) Crous & M.P.S. Câmara comb. nov. Fig. 4
Cercospora richardsoniae Ellis & Everh., *Jour. Mycol.* **8**: 72. 1902.
Cercospora carveriana Sacc. & D. Sacc., *Syll. Fung.* **18**: 607. 1906 (*nom superfl.*).

Leaf spots amphigenous, indistinct. *Mycelium* internal and external, composed of finely verruculose, branched, light to medium brown hyphae, 3.5-4 µm diam., frequently constricted at septa, and climbing leaf hairs. *Caespituli* fasciculate, amphigenous, medium brown on leaves, up to 60 µm wide and 110 µm high. *Conidiophores* arising singly from superficial mycelium, or aggregated in dense fascicles, arising from the upper cells of a light brown stroma up to 40 µm wide; conidiophores medium brown, finely verruculose, subcylindrical, straight to geniculate-sinuous, unbranched, 3-10-septate, 30-80 x 4.5-5.5 µm. *Conidiogenous cells* terminal, unbranched, medium brown, finely verruculose, tapering to flat-tipped, inconspicuous apical loci, proliferating sympodially, 10-20 x 3-5 µm. *Conidia* solitary, pale brown, finely verruculose, narrowly obclavate, apex obtuse, base long obconically truncate,

Fig. 4. Conidia and conidiophores of *Pseudocercospora richardsoniae* (BPI 440390). Bar = 10 µm.







straight to slightly curved, (1-)4-7(-12)-septate, (30-)65-100(-130) x (2-)3-3.5(-4.5) µm; hila inconspicuous.

Specimen: USA, Tuskegee, Ala., on *Richardsonia glabra* (Rubiaceae), G.W. Graver, 31 Aug. 1900, Ellis & Everhart's Fungi Columbiani No. 1612, PBI 440390 (holotype), BPI 440389 (isotype).

Pseudocercospora richardsoniae and *Cercospora richardsoniae* Henn. both occur on species of *Richardsonia* in the southern part of the USA (Alabama) and Brazil (São Paulo), respectively. These two taxa are further compared and discussed below.

5. ***Pseudocercospora lonchocarpi*** (J.A. Stev.) Crous & M.P.S. Câmara comb. nov. Fig. 5

Cercospora lonchocarpi J.A. Stev., *Mycologia* **38**: 532. 1946.

Leaf spots amphigenous, irregular, 2-20 mm diam., grey to light brown on adaxial surface, surrounded by a thin, dark brown border; lesions becoming confluent with age. *Mycelium* internal and external, composed of smooth, branched, pale olivaceous hyphae, 2.5-3 µm diam. *Caespituli* fasciculate, predominantly epiphyllous, dark brown on leaves, up to 80 µm wide and 100 µm high. *Conidiophores* aggregated in dense fascicles, arising from the upper cells of a brown stroma; conidiophores medium brown, finely verruculose, subcylindrical, straight to geniculate-sinuous, unbranched, 3-6-septate, 25-75 x 3-4.5 µm. *Conidiogenous cells* terminal, unbranched, olivaceous to light brown, finely verruculose, tapering to inconspicuous, flat-tipped apical loci, proliferating sympodially, or 1-3 times enteroblastically and percurrently, 5-25 x 2.5-3 µm. *Conidia* solitary, pale olivaceous to light brown, finely verruculose, subcylindrical to narrowly obclavate, apex subobtuse, base long obconically truncate, straight to curved, (1-)3-7(-13)-septate, (30-)50-100(-120) x 3-3.5(-4.5) µm; hila inconspicuous.

Specimens: Brazil, Pará, Belém, on fields of the Inst. Agr. do Norte, on *Lonchocarpus utilis* (Fabaceae), A.W. Archer, No. H-464, 14 Feb. 1945, BPI 437873 (holotype); Pará, Belém, on fields of the Inst. Agr. do Norte, on *Lonchocarpus urucu* (Fabaceae), A.W. Archer, No. H-428, 6 Jul. 1942, BPI 437872 (paratype).

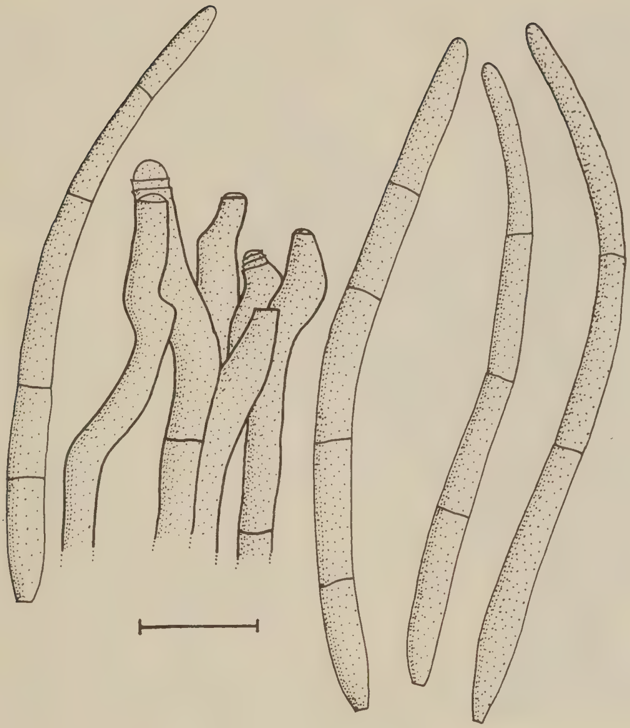


Fig. 5. Conidia and conidiophores of *Pseudocercospora lonchocarpi* (BPI 437873). Bar = 10 µm.

6. *Pseudocercospora richardsoniicola* Crous & M.P.S. Câmara nom. nov. Fig. 6

Cercospora richardsoniae Henn., *Hedwigia* **41**: 117. 1902 (non *C. richardsoniae* Ellis & Everh.).

Leaf spots amphigenous, irregular to circular, 5-12 mm diam., light brown, with a raised, dark brown border, coalescing with age. *Mycelium* internal and external, composed of finely verruculose, branched, light brown hyphae, 2.5-4 µm diam. *Caespituli* fasciculate, amphigenous, medium brown on leaves, up to 100 µm wide and 250 µm high. *Conidiophores* aggregated

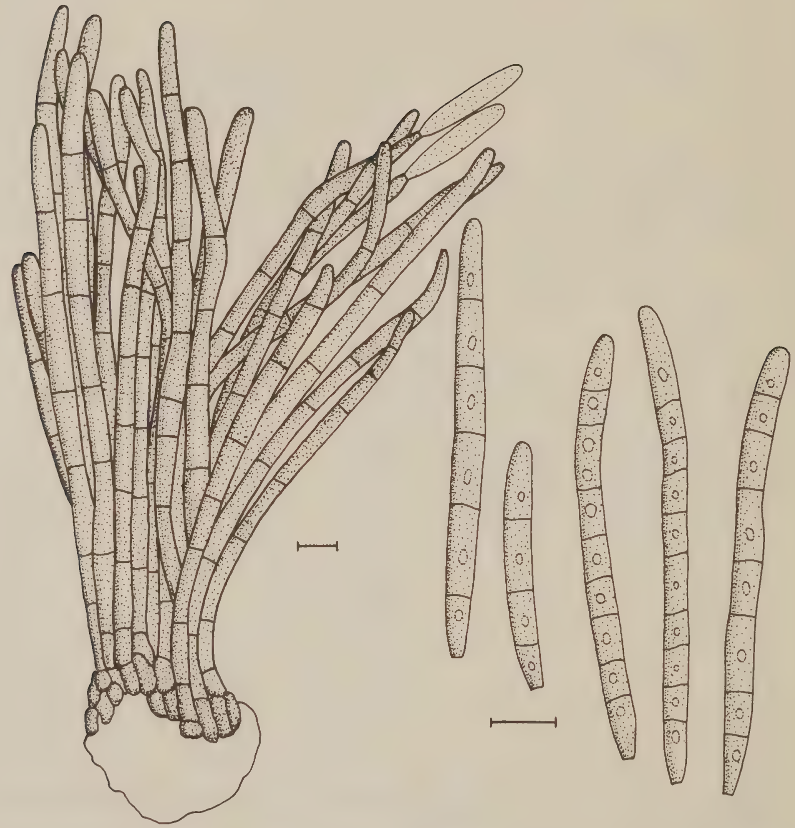


Fig. 6. Conidia and conidiophores of *Pseudocercospora richardsoniicola* (BPI 440387). Bars = 10 µm.

in dense, divergent fascicles, arising from the upper cells of a medium brown stroma up to 100 µm wide; conidiophores medium brown, finely verruculose, cylindrical, straight to slightly curved, unbranched, 3-14-septate, 40-200 x 3.5-5.5 µm. *Conidiogenous cells* terminal, unbranched, medium brown, finely verruculose, tapering to rounded apices, rejuvenating enteroblastically near apex, proliferating sympodially, 15-35 x 3.5-5.5 µm. *Conidia* solitary, light brown, finely verruculose, guttulate, subcylindrical to obclavate, apex obtuse, base obconically truncate, straight to slightly curved, (4-)6-9(-11)-septate, (30-)50-80(-150) x 4-5(-6) µm; hila inconspicuous.

Specimens: Brazil, São Paulo, Botanic Garden, on *Richardsonia* sp. (Rubiaceae), A. Puttemans, 4 Feb. 1901, A. Puttemans Fungi S. Paulensis No. 166, BPI 440387 (holotype); São Paulo, Cantareira, on *Richardsonia brasiliensis*, J.G. Carneiro, 7 Apr. 1932, Inst. Biol. São Paulo Herb. Secç. de Fitopatol. No. 422, BPI 440388.

Two cercosporoid species were described from *Richardsonia* with the same epithet, namely *Cercospora richardsoniae* Ellis & Everh. (1902) from the USA, and *Cercospora richardsoniae* Henn. (1902) from Brazil. Saccardo (1906) proposed a new name for the species described by Ellis & Everhart, namely *C. carveriana* Sacc. & D. Sacc. This was a nomenclatural error, as the species described by Ellis & Everhart appeared in January, and the Hennings species in June, thus making the latter one a homonym of the former. To avoid further confusion, however, Chupp (1954) decided to retain the two species epithets accepted by Saccardo. Proposing two new combinations for these names in *Pseudocercospora* would, however, create two illegitimate names. The epithet described by Ellis & Everhart is thus retained, while a new name is proposed for the later homonym described by Hennings.

The two species can firstly be distinguished by the inconspicuous leaf spots of *Pseudocercospora richardsoniae*, as opposed to the distinct ones of *P. richardsoniicola*. Morphologically they are also distinct with *P. richardsoniicola* having large stromata with conspicuous fascicles, long conidiophores (up to 200 µm), and wider (up to 6 µm), more cylindrical conidia with short obconic bases. In contrast, fascicles of *P. richardsoniae* are inconspicuous, conidiophores are shorter (up to 80 µm), and conidia are narrower (up to 4.5 µm), with long obconically truncate bases.

ACKNOWLEDGEMENTS

The senior author is grateful to Dr. Amy Y. Rossman, Director, US National Fungus Collections, Beltsville, Maryland USA, for providing laboratory space and facilities during this study, and to

Drs. Uwe Braun (Inst. für Geobotanik & Bot. Garten, Martin-Luther-Univ., Halle, Germany) and José C. Dianese (Departemento de Fitopatologia, Univ. de Brasília, Brazil) for reviewing the script.

REFERENCES

Barreto, R.W. & Evans, H.C. 1995. The mycobiota of the weed *Mikania micrantha* in southern Brazil with particular reference to fungal pathogens for biological control. *Mycological Research* **99**, 343-352.

Braun, U. 1995. A monograph of *Cercosporella*, *Ramularia* and allied genera (Phytopathogenic Hyphomycetes). IHW-Verlag, München, Germany.

Chupp, C. 1954. A monograph of the fungus genus *Cercospora*. Ithaca, New York. Published by the author.

Crous, P.W. & Alfenas, A.C. 1995. *Mycosphaerella gracilis* sp. nov. and other species of *Mycosphaerella* associated with leaf spots of *Eucalyptus* in Indonesia. *Mycologia* **87**, 121-126.

Crous, P.W., Alfenas, A.C. & Barreto, R.W. 1997. Cercosporoid fungi from Brazil. 1. *Mycotaxon* **64**, 405-430.

Dianese, J.C. & Câmara, M.P.S. 1994. *Pseudocercospora* aspidospermatis - a new combination for *Bactrodesmiella aspidospermatis*. *Sydowia* **46**, 225-232.

Dianese, J.C., Sutton, B.C. & Tessman, D.J. 1993. Two deuteromycetes, *Phloeosporella flavio-moralis* sp. nov. and *Pseudocercospora punctata* comb. nov., causing leaf lesions on *Eugenia* spp. *Mycological Research* **97**, 123-126.

Inácio, C.A., Furlanetto, C., Hernandez-Gutierrez, A. & Dianese, J.C. 1996. Some *Cercospora* species originally described by Ahmés Pinto Viégas. *Fitopatologia Brasileira* **21**, 405-409.

Medeiros, R.B. & Dianese, J.C. 1994. *Passalora eitenii* sp. nov. on *Syagrus comosa* in Brazil and a key to *Passalora* species. *Mycotaxon* **51**, 509-513.

Saccardo, P.A. 1906. *Sylloge Fungorum* **18**, p. 607.

Viégas, A.P. (1945). Alguns fungos do Brasil - Cercosporae. Boletim *da Sociedade Brasileira de Agronomia* **8**, 1-160.

MYCOTAXON

Volume LXVIII, pp. 311-312 July-September 1998

ON HELMINTHOSPORIUM ANOMALUM

R.A. SHOEMAKER

Eastern Cereal and Oilseed Research Centre[1]
Research Branch, Agriculture and Agri-Food Canada
C.E.F., Ottawa, Ontario, Canada, K1A 0C6

ABSTRACT

Helminthosporium anomalum described from soil in 1927 and rarely reported since, is reduced to a synonym of *Bipolaris sorokiniana,* the anamorph of *Cochliobolus sativus*.

TAXONOMY

***Helminthosporium anomalum* Gilman & Abbott, Iowa State Coll. J. Sci. 1: 321. Fig. 67. 1927.**

This species was described from cultures derived from soil from Iowa and Utah and has rarely been reported since. It is not included in Sylloge Fungorum or in Kirk's (1985) listing of Saccardo's omissions. To establish the identity of *Helminthosporium anomalum*, a search was made for a type specimen. Professor Lois H. Tiffany could not find material of *Helminthosporium anomalum* in ISC. No material is listed under this name at BPI. In the absence of a type specimen, the illustration can serve as type (Art. 8.3, Greuter *et al.* 1994).

Colonies developed on Czapek's agar and on bean agar were described (Gilman & Abbott, 1927). The conidiophores were more or less bent, bearing a terminal group of conidia with lateral conidia borne singly and irregularly on the geniculations. Conidiophores were mostly 150 to 400 µm long, brown, and according to the figure, septate. Conidia were elongate, straight, rounded at both ends, 5-12 times septate, mostly 7, when mature 40 to 90 µm long by 10-15 µm broad. Except for the narrow conidial width, this description fits cultures of *Cochliobolus sativus* (Ito & Kuribayshi in Ito) Drechsler ex Dastur.

The authors illustrated the fungus as Fig. 67 at an unspecified magnification. The original illustration was enlarged by me so that the mean length of the conidia was 65 µm, the mid-point of the original stated lengths, 40-90 µm. At this scale, the following dimensions were derived: 57-74 x 17-26 (avg. 65 x 21). The conidia are substantially wider than indicated in the original measurements.

[1] ECORC Publ. No. 981259.1248

A comparison was made with published illustrations and descriptions of *Cochliobolus sativus*. *Helminthosporium anomalum* matches well Drechsler's Plate 19, illustrated from a culture on corn meal agar. The dimensions of 5- to 7-septate conidia illustrated by Drechsler range from 52-71 x 16-24 µm similar to the range derived from Gilman & Abbott's illustration of *Helminthosporium anomalum*.

My interpretation from the description and original figures is that Gilman & Abbott's fungus is identical to *Bipolaris sorokiniana* (Saccardo In Sorokin) Shoemaker, the anamorph of *Cochliobolus sativus*.

The anamorph of *Cochliobolus sativus* was reported from Iowa and described as a parasite of barley under the name *Helminthosporium sativum* Pammel, King & Bakke (1910). This too is a synonym of *Bipolaris sorokiniana*. The microscopic appearance of the fungus on the host is quite different from the appearance in culture. On barley leaves, the conidia are long, slender and curved, as illustrated in Drechsler's Plate 18 but, in culture, they are short, fat and straight. One can understand why Gilman & Abbott thought they had a distinct species.

REFERENCES

Drechsler, C. 1930. Some graminicolous species of *Helminthosporium*: I. J. Agric. Res. 24(8): 641-740. Plates 1-33.

Gilman, J.C. & E.V. Abbott 1927. A summary of the soil fungi. Iowa State Coll. J. Sci. 1: 225-343.

Greuter *et al.* 1994. International Code of Botanical Nomenclature. Koeltz Scientific Books. Konigstein.

Kirk, P.M. 1985. Saccardo's Omissions. Index of Fungi Supplement, 1-101.

Pammel, L.H., King, Charlotte M. and A.L. Bakke. 1910. Two barley blights, with comparison of species of Helminthosporium upon cereals. Iowa State College Experiment Station Bull. 116: 178-190. Plates I-IV.

MYCOTAXON

Volume LXVIII, pp. 313-320 July-September 1998

FILOSPORELLA EXILIS SP. NOV. ON SUBMERGED PLANT DEBRIS FROM BELARUS

Vladislav I. Gulis

Department of Botany, Belarus State University, Skoriny pr. 4, 220050 Minsk, Belarus

and

Ludmila Marvanová

Czech Collection of Microorganisms, Masaryk University, Tvrdého 14, 602 00 Brno,
Czech Republic

Abstract: *Filosporella exilis* sp. nov. is described from decaying grass blades, *Equisetum fluviatile* stems and conifer wood debris submerged in a river in Belarus. Besides underwater macroconidia formed on annellated conidiogenous cells, it also has arthroconidia typically produced aerially. Two microconidial states may be present in some isolates: one with phialides with long, cylindrical collarettes and another whose conidiogenesis is unclear.

Key words: Taxonomy, aquatic hyphomycetes, streams.

A number of fungi with filiform conidia was isolated in autumn in the years 1996 and 1997 during a survey of watercourses of the Berezinsky Biosphere Reserve, Belarus. This was undertaken to obtain cultures of aquatic hyphomycetes for use in screening for antimicrobial activity (Gulis &. Stephanovich 1996). Several of these isolates belong to an undescribed species of *Filosporella*. The new species fits well into the group of nonsporodochial members of this genus which produce aerial arthroconidia and have underwater conidia growing on annellate conidiogenous cells. It differs from all five known species and therefore it is described here as new.

Filosporella exilis Gulis & Marvanová sp. nov. Figs. 1-4
Etym.: *exilis* (Lat.) = thin (refers to the conidial shape)

Fungi mitosporici, hyphomycetes. Teleomorphosis ignota.
Coloniae in agaro maltoso modice crescentes, pallide griseae usque ad isabellinae, leviter colore aurantiaco tinctae. Mycelium aerium griseoalbum, mycelium in substrato atrum, partibus nonnullis rugosum. Pars reversa atra, pallescens et leniter aurantiaca ad marginem versus. Hyphae aeriae cum parietibus hyalinis vel fuscis, hyphae in substrato brunneae.
Status macroconidialis: *Filosporella*: subaquaticus. Conidiophora semimacronematosa, simplicia vel parce ramosa, septata, usque ad 980 x 3-4 µm, rami 17-69 x 2.5-3 µm, saepe binatim vel ternatim acrogeni vel laterales, typice adpressi. Cellulae conidiogenae incorporatae vel raro discretae, apicales vel laterales, 19-42 x 2.5-3 µm, percurrenter vel raro sympodialiter prolificantes, in parte distali saepe densiter annellatae subinflataeque.

Conidia singularia, apicalia, recta vel leniter curvata, cylindrica vel subangustata ad apicem versus, (90-) 128-180 (-240) x 2.5-3.5 µm, apex obtusus vel subulatus, basis truncata vel cum extensione subulata, percurrente, usque ad 31 µm longa ornata. Secessio schizolytica.

Status arthroconidialis: typice aerius, sed etiam subaquaticus. Parietes cellularum fuscae usque ad hyalinae. Conidiophora micronematosa vel semimacronematosa. Hyphae conidiogenae simplices vel ramificatae, fragmentatio schizolytica. Arthroconidia cylindrica vel subfusoidea, recta vel paulo curvata, nonnumquam cum cellulis inflatis, pauciseptata, raro ellipsoidea et aseptata, usque ad 200 x 2-2.8 µm, extremitates truncatae cum cicatrice subincrassata vel rotundata.

Status microconidialis I: subaquaticus. Conidiophora semimacronematosa, simplicia vel pauce ramosa, apicalia vel lateralia, usque ad 570 x 2.5-3.5 µm, septata, cellulae parietibus glabris vel verrucosis, fuscis. Cellulae conidiogenae phialidicae, acropleurogenae, singillatim vel usque ad 4 per apicem conidiophori, ovales vel subcylindricae, fuscae vel hyalinae, 10-17 x 2.8-4.2 µm, collum cylindricum, 5-20 x 2-2.5 µm. Conidia bacilliformia, 7.5-10 x 1.5-2 µm.

Status microconidialis II: typice ad fragmenta macroconidiorum vel ad arthroconidia, conidiophoris absentibus. Cellulae conidiogenae incorporatae, determinatae, saepe vacuae, apicales et subulatae vel intercalares cum extensione conidiifera laterali. Modus conidiogenesis ignotus. Conidia aggregata, bacilliformia, nonnumquam leniter inflata in media parte, 4.5-11 x 0.8-1.2 µm, cicatrix nonnumquam subincrassata.

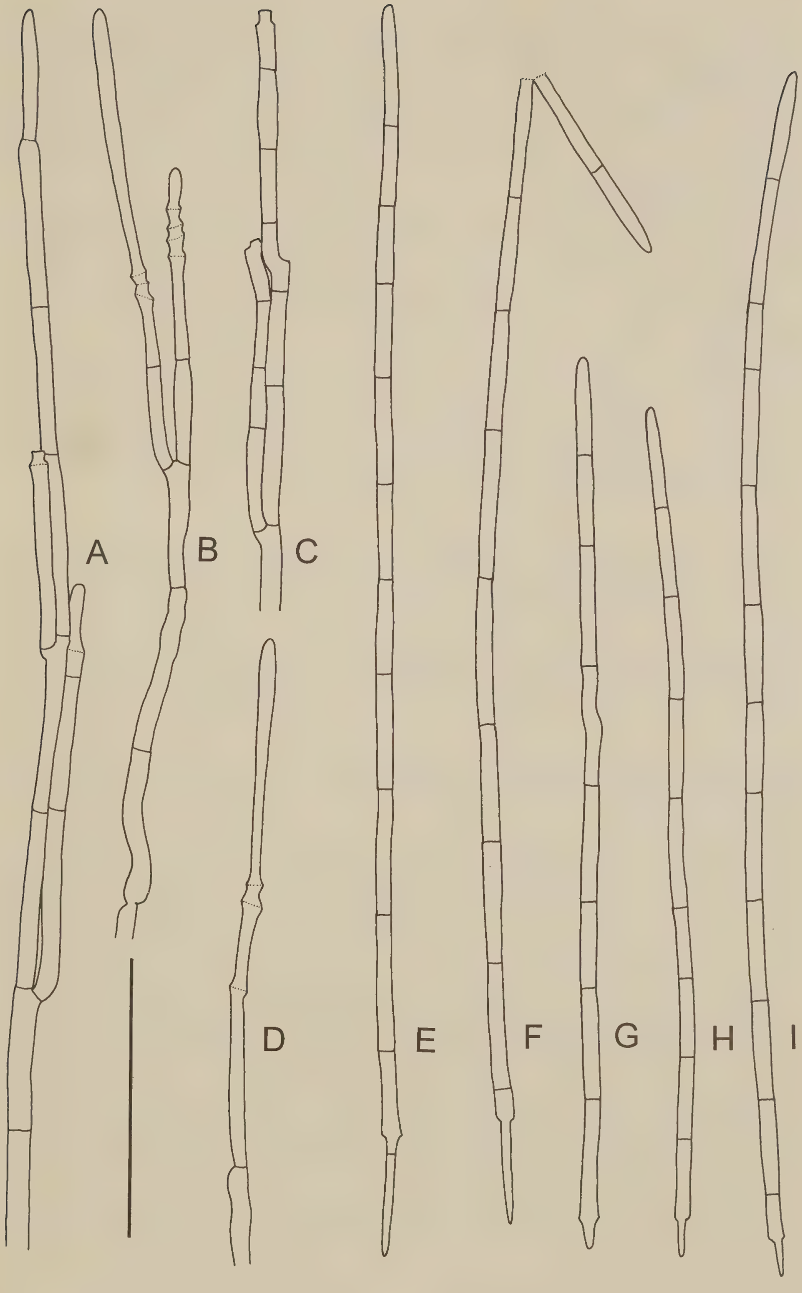
Habitat: ad caulem putridum *Equiseti fluviatilis* L. in flumine Busianka submersum, prope viam publicam inter oppida Minsk et Lepel, in reservatione Berezinski dicta, regione Vitebsk, Belarussia, mense Septembro 1996 V.I. Gulis legit.
Holotypus: IMI 378148, ex VG-98a.

Mitosporic fungi, hyphomycetes. Teleomorph unknown.

Colonies (2% malt agar) growing moderately fast, reaching 15-25 mm diam. in 13 days at 15° C, pale grey to isabelline with an orange hue. Reverse blackish in the centre, paler or light orange at margin. Aerial mycelium cottony, dense and funiculose in the centre, sparse towards margin, whitish, becoming greyish with age; hyphae hyaline to fuscous, substrate mycelium fuscous to brown, hyphae up to 5 µm wide, walls slightly thickened, glabrous to verrucose. Reddish brown soluble pigment is produced in stationary liquid culture (potato maltose broth) in all isolates.

Macroconidial state: *Filosporella* (Fig. 1 A-I, Fig. 3 A-D, Fig. 4 A,B,D,E, G-I), produced underwater, preferably at ca. 5° C. Conidiophores semimacronematous, simple or sparsely branched, septate, up to 980 x 3-4 µm, branches few, in one or two orders, 17-69 x 2.5-3 µm, acrogenous and then often binate or ternate, or lateral and then alternate, adpressed or slightly diverging. Conidiogenous cells integrated or discrete, 19-42 x 2.5-3 µm, apical or less often lateral, proliferations percurrent or rarely sympodial, distal part closely annellate, often slightly inflated. Conidia integrated with the conidiogenous cell at an early stage of development, single, straight, rarely slightly curved, cylindrical to slightly attenuate towards apex, (90-) 128-180 (-240) x 2.5-3.5 µm, up to 15 septate, apex rounded or subulate, base truncate or with a subulate percurrent extension up to 31 µm long, appearing soon after conidium release. Conidial secession schizolytic.

Fig. 1. *Filosporella exilis,* VG-98a. A,B,D. Conidiophores with developing conidia of the *Filosporella* state. Note the typical annellations on the conidiogenous cells. C. Spent conidiophore. E-I. Detached conidia. Scale bar = 50 µm.


A
B
C
D
E
F
G
H
I

Arthroconidial state (Fig. 2 D-H, Fig. 3 E-J, Fig. 4 C,F, J-M): typically produced aerially, but also underwater, cell walls fuscous to hyaline. Conidiophores micronematous or semimacronematous and then with sympodial elongations. Conidiogenous hyphae single or aggregated at the conidiophore apex, simple or branched, fragmentation schizolytic. Arthroconidia cylindrical or subfusoid, straight or gently curved, sometimes with inflated cells, few-septate, up to 200 x 2-2.8 µm, ends truncate with slightly thickened scars or somewhat swollen. Ellipsoid aseptate arthroconidia appear rarely.

Microconidial state I (Fig. 2 A-C, Fig. 3 K-O): produced underwater. Conidiophores semimacronematous, simple or sparsely branched, apical or lateral, up to 570 x 2.5-3.5 µm, septate, cell walls smooth or verrucose, fuscous. Conidiogenous cells phialidic, acro-pleurogenous, single or up to four per conidiophore apex, oval to almost cylindrical, fuscous or hyaline, 10-17 x 2.8-4.2 µm, collarette cylindrical, 5-20 x 2-2.5 µm, periclinal thickening distinct. Microconidia bacilliform, hyaline, 7.5-10 x 1.5-2 µm. Germination not seen.

Microconidial state II (Fig. 2 I-N): typically on fragmented macroconidia or on arthroconidia, in water, conidiophores lacking. Conidiogenous cells integrated, determinate, hyaline, often seen empty, apical and subulate or intercalary with a lateral conidiiferous peg. Method of conidiogenesis unknown. Conidia single or grouped, bacilliform, sometimes slightly inflated in the median part, hyaline, 4.5-11 x 0.8-1.2 µm, scar often somewhat thickened. Germination not seen.

Cultures examined: VG-86, VG-97, from unidentified submerged decaying grass blades, Sep. 1996, river Serguch nr. the village Kraitsy, 160 m alt., the Berezinsky Biosphere Reserve, Vitebsk Region, Belarus; VG-98, VG-98a, from decaying stems of *Equisetum fluviatile*, Sep. 1996, river Busianka nr. Minsk-Lepel highway, 170 m alt., the Berezinsky Biosphere Reserve, Vitebsk Region, Belarus; VG-130, VG-131, VG-132, from submerged decaying branch of *Picea abies* (L.) Karst. with needles, Oct. 1997, Serguch Canal nr. the village Kvetche, 160 m. alt., the Berezinsky Biosphere Reserve, Vitebsk Region, Belarus. All material collected and cultures isolated by V.I. Gulis.

The macroconidia are produced in a few days after submergence of culture slices, but at the same time there are also the arthroconidia, which to some extent overlap in size and shape with the former.

The isolates are slightly different from each other: the colony diam. under the same conditions varies from 15 mm in VG-98a to 25 mm in VG-98. The colony colour is pale grey in VG-98a, pale greyish-olive with an orange hue in the rest of isolates, producing copious honey-coloured exudate in VG-98. Along with this, the black reverse under the central part of the colony is surrounded by a pale zone in 98a, which is more distinct in VG-86 and VG-97 and vivid orange in VG-98. The *Filosporella* state is most pronounced in VG-98a, which reacts very positively (producing masses of conidia) when culture pieces in water are subjected to aeration. In the other isolates it declines from VG-86 through VG-97 to VG-86, but it is relatively abundant in the isolates VG-130, VG-131 and VG-132. There are also differences in the intensity of macroconidiophore branching: it is rather poor in VG-98a, where unbranched conidiophores are not exceptional. Macroconidia vary in size and shape: they are shorter (125-175 µm) and usually more pointed in VG-86, VG-98, VG-130, VG-131, VG-132.

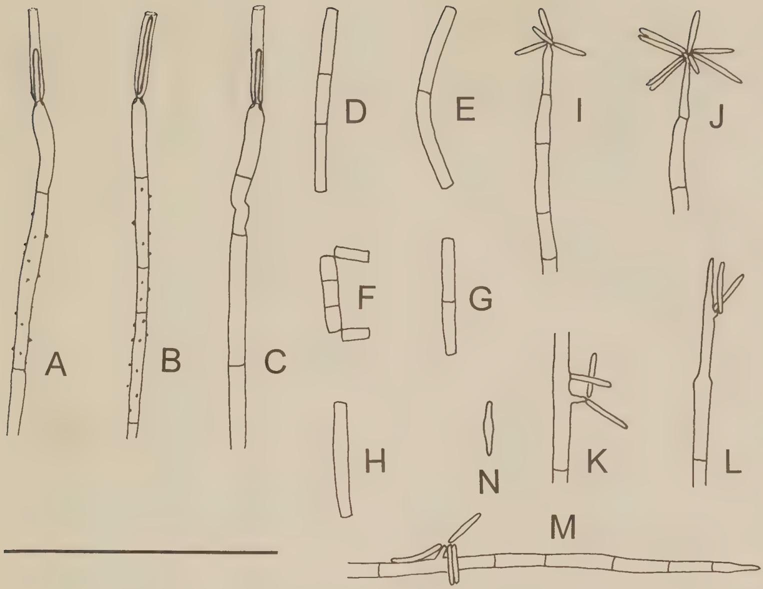


Fig. 2. *Filosporella exilis*, VG-98a. A-C. Microconidial state I. Note the long collarettes on phialides. D-H. Arthroconidia. I-M. Microconidial state II. Conidiogenous cells with conidia. N. Medially inflated conidium. Scale bar = 50 µm.

The arthroconidial state appears abundantly in all isolates on agar media without submergence and typically above water level, but sparsely also underwater in standing as well as aerated cultures. There are small differences in morphology: the arthroconidia are typically short-cylindrical in VG-97 and VG-86, often with inflated cells in the latter, sometimes fragmenting into short ellipsoid cells in the former isolate. They are very uniform in VG-98, VG-130, VG-131 and VG-132: cylindrical or slightly subfusoid, the majority ca. 20-30 µm long. In VG-98a they are often long-cylindrical, sometimes indistinguishable from macroconidia.

Microconidial state I was observed in five isolates, i.e. VG-86, VG-97, VG-98a, VG-131 and VG-132. Microconidial state II was found in VG-97 and VG-98a. The exact method of conidiogenesis could not be interpreted with the aid of light microscope. Little fascicles of conidia are seen at the apices of conidiogenous cells, but it is unclear whether they are produced from a single or multiple conidiogenous locus.

It may be questioned whether it is wise to classify all the above isolates in the same species when there are such differences in conidium morphology, i.e. some isolates with short conidia and others with conidia nearly 2.5 times longer and arthroconidia either with inflated cells which do not appear as a result of ageing of the culture or still others with long-fusoid or cylindrical shape. However, we see a unifying feature in all these variations: (1) the conidiophores of the *Filosporella* state are similar in the typically parallel arrangement of their branches, (2) there are always at least some cylindrical

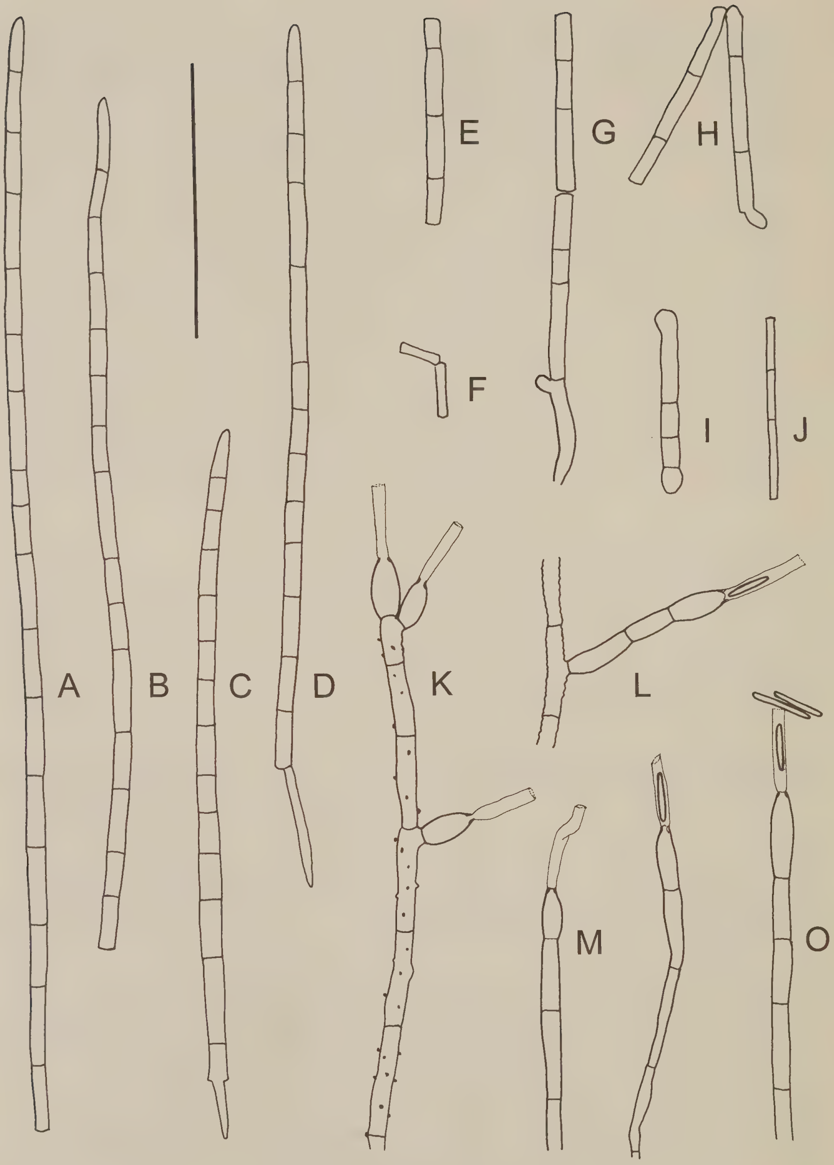


Fig. 3. *Filosporella exilis*, VG-97. A-D. Detached macroconidia. E-J. Arthroconidia. Note the somewhat inflated end-cells in I. K-O. Microconidial state I. Note the coarsely verrucose conidiophore in K and the rough-walled hypha in L. Scale bar = 50 µm.

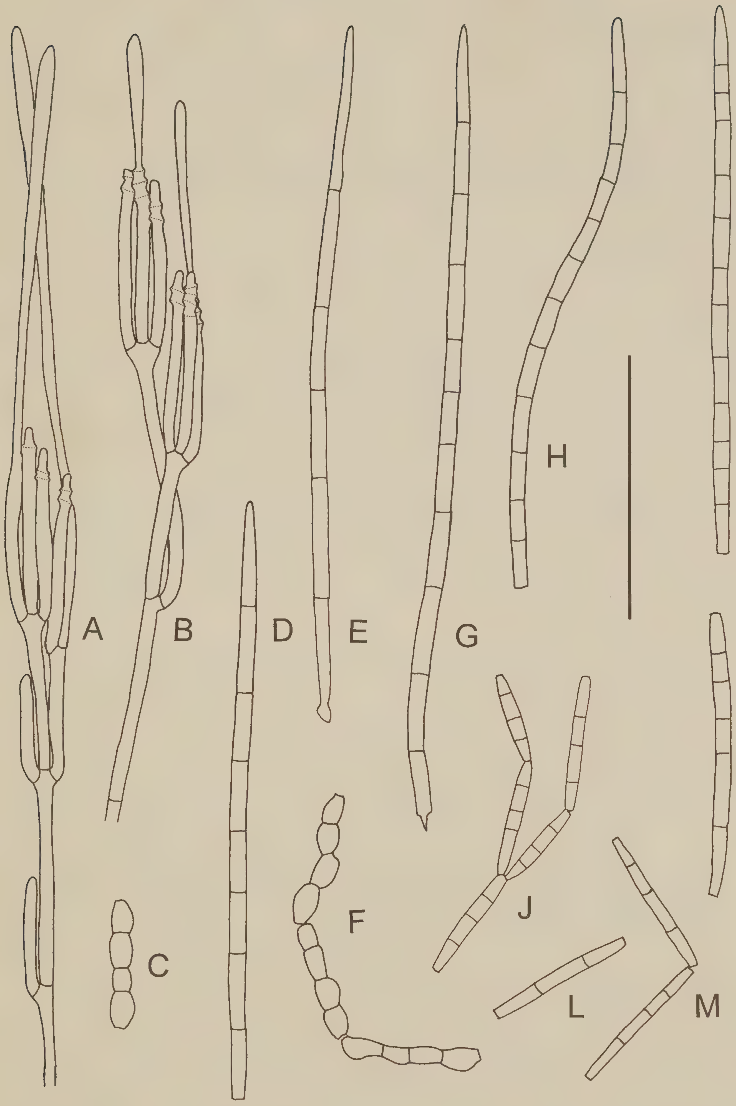


Fig. 4. *Filosporella exilis*, VG-86. A,B. Conidiophores with developing conidia. Note the profuse branching in contrast with VG-98a. D,E,G. Macroconidia. C,F. Arthroconidia with inflated cells. VG-98. H,I. Detached macroconidia. J-M. Arthroconidia. Scale bar = 50 μm.

arthroconidia and (3) the absence of microconidial states in some isolates of the same species is known in other aquatic hyphomycetes also.

The disposition of this species in *Filosporella* is substantiated by branched conidiophores, and percurrent (rarely sympodial or intermediate) proliferation of conidiogenous cells resulting in close annellations. The conidia are most similar to those of *F. aquatica* Nawawi, but shorter and distinctly narrower. The series of new conidiogenous cells described by Nawawi (1976) as formed by percurrent proliferation after secession of each crop of conidia has not been seen in our species; in *F. exilis* the conidiogenous cells show only slight increase in length after secession of each conidium, this process leaving the characteristic "rings" on the conidiophore apices. Neither arthroconidia nor microconidial states have been observed in *F. aquatica*. *Filosporella annelidica* (Shearer & Crane) Crane & Shearer (1977) has conidia of similar size to our species, but these are typically sigmoid, with subulate ends. The conidiophores in *F. annelidica* are sporodochial, profusely branched at several levels. Phialidic microconidial state and/or aerial arthroconidia are present in three species, but in them the conidia of the *Filosporella* state are much shorter: sigmoid in *F. versimorpha* Marvanová *et al.* (1992) and straight in *F. fistucella* Marvanová & Fisher (1991) as well as in *F. pinguis* Marvanová & Bärlocher (1998). The latter, unlike any other described *Filosporella*, has globose microconidia.

The type species, *F. aquatica*, was described from the tropics and so far we are aware, it is known from the type locality only (Nawawi 1985). The other four species occur in temperate climates. Two of them were isolated as endophytes from symptomless living roots of *Alnus glutinosa* (L.) Gaertn. (Marvanová & Fisher 1991, Marvanová *et al.* 1992).

Acknowledgment

We are grateful to Prof. John Webster, Exeter, for the presubmission review and for language corrections.

References

Crane J.L. & Shearer C.A. (1977). *Rogersia*, a later name for *Filosporella*. *Mycotaxon* **6**: 27-28.

Gulis V.I. & Stephanovich A.I. (1996). Search for antibiotic substances producers among aquatic hyphomycetes. In: Vimba E., Piterans A. & Avota I. (eds.). Fungi and Lichens in the Baltic Region: Abstracts of the 13th International Conference on Mycology and Lichenology, Riga, pp. 19-20.

Marvanová L. & Bärlocher F. (1998). New species of *Filosporella*, *Pachycladina* and *Pleuropedium* from Canadian streams. *Mycol. Res.* **102**: 750-754.

Marvanová L. & Fisher P.J. (1991). A new endophytic hyphomycete from alder roots. *Nova Hedwigia* **52**: 33-37.

Marvanová L., Fisher P.J., Aimer R. & Segedin B.C. (1992). A new *Filosporella* from alder roots and from water. *Nova Hedwigia* **54**: 151-158.

Nawawi A. (1976). *Filosporella* gen. nov., an aquatic hyphomycete. *Trans. Br. Mycol. Soc.* **67**:173-176.

Nawawi A. (1985). Aquatic hyphomycetes and other water-borne fungi from Malaysia. *Malayan Nature J.* **39**: 75-134.

MYCOTAXON

Volume LXVIII, pp. 321-325 July-September 1998

A NEW VARIETY OF BAGGEA PACHYASCUS (PATELLARIACEAE, ASCOMYCOTA) FROM FINLAND

M. MAGNES, CH. SCHEUER & U. SÖDERHOLM*

Karl-Franzens-Universität Graz, Institut für Botanik, Holteigasse 6, A-8010 Graz,
Austria, E-mail: martin.magnes@kfunigraz.ac.at
* Säästäjänkatu 11 C 17, FIN-33840 Tampere, Finland

Abstract: *Baggea pachyascus* AUERSW. var. *macrospora* MAGNES, SCHEUER & SÖDERHOLM var. nova is described. It was found on ± decorticated twigs of *Salix* spec. in Finland and differs from var. *pachyascus* by the larger ascospores and fewer-spored asci.

Keywords: *Baggea pachyascus* var. *macrospora*, Patellariaceae, Ascomycota, *Salix*.

Until the re-assessment of the Patellariaceae by KUTORGA & HAWKSWORTH (1997), this family was usually considered as not well defined (e.g., ARX & MÜLLER 1975: 56). KUTORGA & HAWKSWORTH (1997) have restricted the Patellariaceae to genera with apothecioid or hysteriform, usually dark-coloured ascomata that are usually closed at the beginning of development, a pseudoparenchymatous excipulum with a crust-like outer surface, a pseudoparenchymatous or prosenchymatous hypothecium, a hamathecium consisting of paraphysoids forming a (pseudo-)epithecium above the asci (occasionally paraphyses are added in a later stage of development), bitunicate asci (fissitunicate where known), and septate, hyaline or brown ascospores.

KUTORGA & HAWKSWORTH (1997) confirmed that the genus *Baggea* AUERSW. has to be included in the Patellariaceae in their restricted sense and provided a new description and illustrations for *Baggea pachyascus* AUERSW., the single species of the genus, and also designated a neotype.

The third author of this paper has collected a specimen of *B. pachyascus* in Finland that apparently deserves varietal rank.

Baggea pachyascus AUERSWALD in Hedwigia 5: 1 (1866)
var. ***macrospora*** **MAGNES, SCHEUER & SÖDERHOLM** var. nova

HOLOTYPUS hab. in partibus ± decorticatis ramulorum emortuorum *Salicis* spec., FINLANDIA, Tavastia australis, Lempäälä, Höytämö, Grid 27°E 6816:330, 26.12.1996, leg. U. SÖDERHOLM (Herb. GZU).

In ± decorticated parts of dead twigs of *Salix* spec., FINLAND, Tavastia australis, Lempäälä, Höytämö, Grid 27°E 6816:330, 26.12.1996, leg. U. SÖDERHOLM (Herb. GZU).

Diagnosis

A varietate typica, *Baggea pachyascus* var. *pachyascus*, characteribus macroscopicis et anatomicis haud distincta, sed differt ascosporis paucioribus (ca. 16-40) per ascum et majoribus, (18-) 20-32 (-35) x (3-) 4-5 µm [var. *pachyascus* (12.5-) 14-16 (-18) x 2.5 - 3 (-3.5) µm, KUTORGA & HAWKSWORTH 1997].

The new variety resembles *Baggea pachyascus* var. *pachyascus* in macroscopical and anatomical characters, but differs in its fewer-spored asci (ca. 16-40 ascospores per ascus, whereas the asci of var. *pachyascus* contain 50-70 ascospores) and its larger ascospores, (18-) 20-32 (-35) x (3-) 4-5 µm [var. *pachyascus* (12.5-) 14-16 (-18) x 2.5 - 3 (-3.5) µm, KUTORGA & HAWKSWORTH 1997].

Description

Ascomata dispersed or in small groups, blackish brown to blackish, superficial, seated on the substrate with a broad base, ± globose when young, opening by a longitudinal slit or some radial ruptures at maturity, then apothecium-like or more rarely somewhat hysteriform, 250-400 (-500) µm in diameter, 300-350 µm in height (plate 1, a).

Lateral **excipulum** 10-15 µm thick in longitudinal section, of textura globulosa-angularis, with dark cell walls; basal excipulum up to ca. 50 µm thick, paler brown at the base than the lateral excipulum, increasingly paler towards the hyaline hypothecium and subhymenium.

Hamathecium consisting of numerous, filiform, hyaline, septate paraphysoids glued together and to the asci by a tough hymenial gel; paraphysoids 1.5-2 µm thick, often with slightly swollen end cells, often branched in the upper part, forming a pseudoepithecium exceeding the ascus tips by up to 15 µm; hymenial gel IKI+ blue, especially towards the surface coloured by brownish granules 0.1 µm in size (fig. 1, b).

Asci oblong-clavate when young (broadest in the upper third), oblong-cylindrical at maturity, 80-90 x 23-25 µm, containing about 16 - 40 ascospores (ca. 50 - 70 in var. *pachyascus*), with croziers, fissitunicate; ectotunica very thin, separating from the endotunica only when squashed firmly; endotunica ca. 1 µm thick in the basal part, up to 2 µm thick in the upper third, not appearing layered in KOH mounts, without an ocular chamber; asci not maturing simultaneously, i.e., every fruitbody containing asci at various stages of development (plate 1, b, c; fig. 1, a).

Ascospores brown, smooth, thin-walled, slightly curved (sausage-shaped), (18-) 20-32 (-35) x (3-) 4-5 µm, usually with 3 transverse septa, only rarely up to 6 septa (fig. 1, c).

Distribution: only known from the type locality.

Additional specimen examined: *Baggea pachyascus* var. *pachyascus*, Germany, Bavaria, Windsheim, in ramis *Quercus* emortuis, 1874, leg. H. REHM (THÜMEN, Mycotheca universalis 278, as *Baggea pachyascus* AWD.; Herb. GZU).

Two specimens of Myc. univ. 278 were also cited by KUTORGA & HAWKSWORTH (1997: 29).

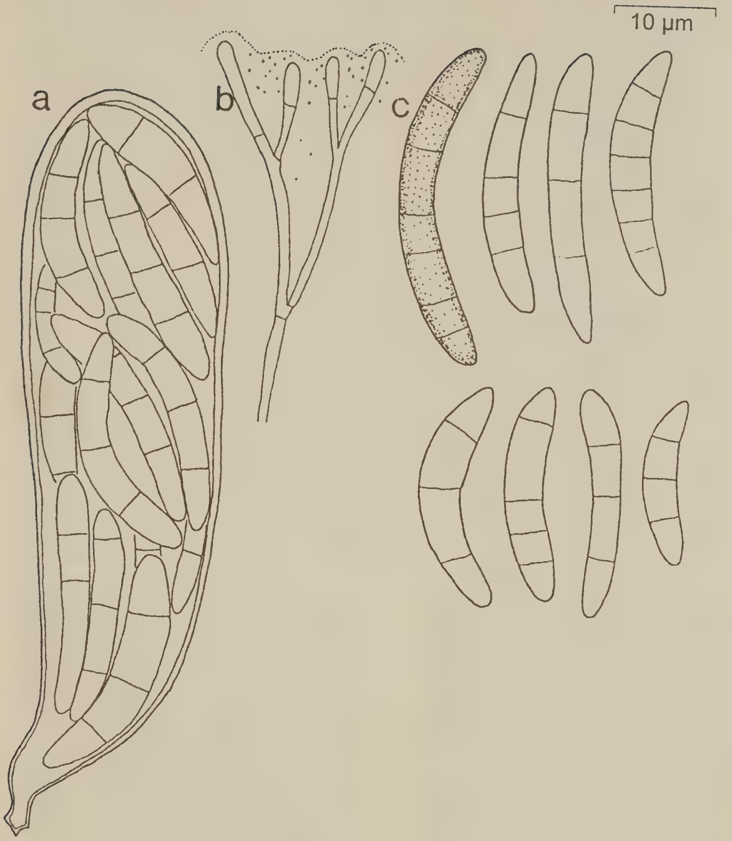


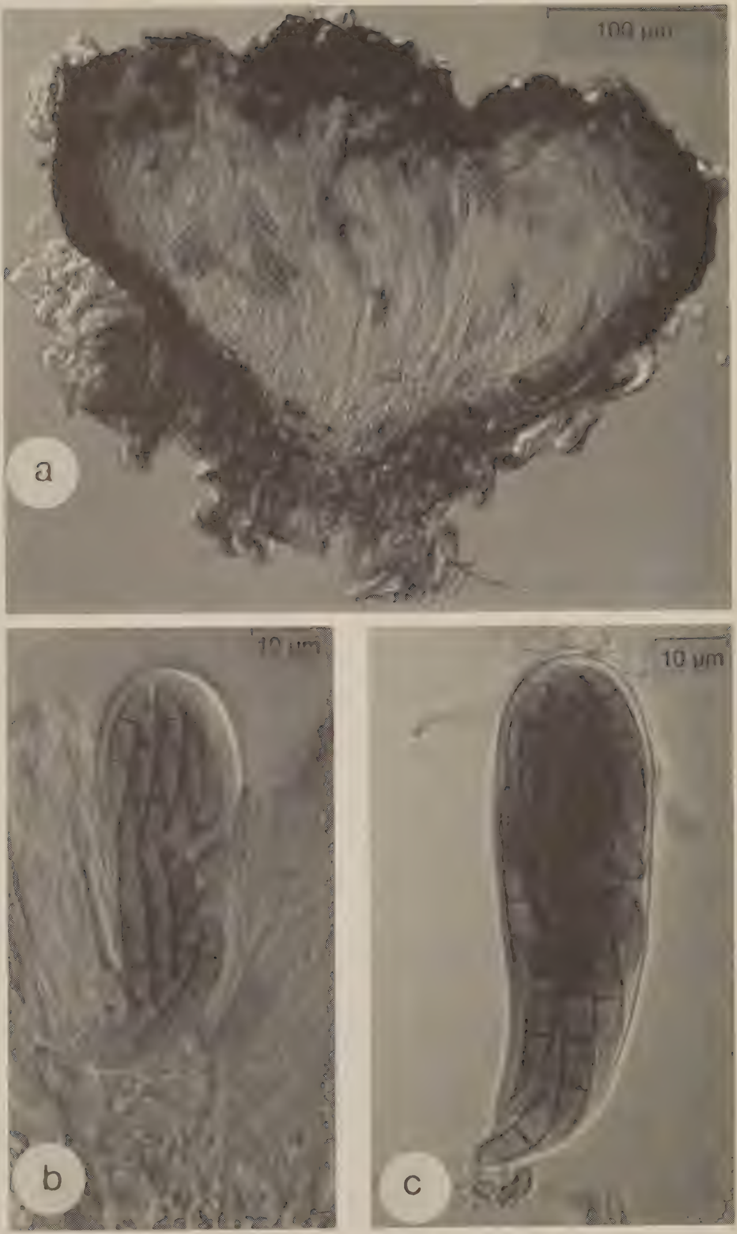
Fig. 1. *Baggea pachyascus* var. *macrospora*: a. Ascus; b. Paraphysoids, upper part with hymenial gel and brownish granules; c. Ascospores (only the first one shaded).

It should be noted here that the original description of the genus *Baggea* AUERSW. was published in Hedwigia vol. 5, not vol. 1. At least two important reference works (viz. SACCARDO 1883: 760 and FARR et al. 1979: 170) cite Hedwigia vol. 1.

We want to thank O. ERIKSSON and R. P. KORF for acting as pre-submission reviewers.

References

ARX J. A. V., MÜLLER E. 1975. A re-evaluation of the bitunicate Ascomycetes with keys to families and genera. Stud. Mycol. 9: 1-159.


100 µm
a
10 µm
b
10 µm
c

AUERSWALD B. 1866. *Baggea* Awd. nov. gen. Hysteriacearum. Hedwigia 5 (1): 1.

FARR E. R., LEUSSINK J. A., STAFLEU F. A. (eds) 1979. Index nominum genericorum (Plantarum). Vol. 1. Regnum Vegetabile 100: 630 pp.

KUTORGA E., HAWKSWORTH D. L. 1997. A re-assessment of the genera referred to the family Patellariaceae (Ascomycota). Syst. Ascomycetum 15(1-2): 1-110.

SACCARDO P. A. 1883. Sylloge fungorum omnium hucusque cognitorum. Vol. II. 813 pp., Add. 69 pp., Index 77 pp. Padova.

Plate 1. *Baggea pachyascus* var. *macrospora*: a. longitudinal section of the apothecium; b. ascus and paraphysoids within the hymenial gel; c. ascus with mature ascospores.

MYCOTAXON

Volume LXVIII, p. 327-344 July-September 1998

NEW AUSTRALASIAN USTILAGINALES. *

KÁLMÁN VÁNKY
Universität Tübingen, Botanisches Institut, Spezielle Botanik und Mykologie,
Auf der Morgenstelle 1, D-72076 Tübingen, Germany

ABSTRACT

The smut fungi on species of *Triodia, Pseudoraphis, Chamaeraphis, Iseilema* (Gramineae), and *Entorrhiza* (on Cyperaceae and Juncaceae) have been studied in connection with supposedly new Ustilaginales. New species proposed are: *Ustilago inaltilis* K. Vánky & A. A. Mitchell (type on *Triodia longiloba*, Australia); *Sporisorium anthracoideisporum* K. Vánky & R. G. Shivas (type on *Pseudoraphis spinescens*, Papua New Guinea); *Sporisorium pseudoraphis* K. Vánky (type on *Pseudoraphis spinescens*, from the Philippine Islands); *Entorrhiza casparyanella* K. Vánky (type on *Juncus gregiflorus*, New Zealand); and *Sporisorium iseilematis-ciliati* K. Vánky (type on *Iseilema ciliatum*, Australia). Keys are given to the known *Entorrhiza* species and to the smut fungi on *Triodia*, *Iseilema*, *Pseudoraphis* and *Chamaeraphis*. New combination proposed: *Sporisorium chamaeraphis* (H. Sydow) K. Vánky, based on *Sorosporium chamaeraphis*.

Study of some smut fungi collected in Australia, Papua New Guinea and New Zealand, revealed several undescribed species.

A NEW *USTILAGO* ON *TRIODIA* (GRAMINEAE)

On the c. 35 host plant species, belonging to the subtribe *Triodiinae* (Gramineae), only two smut fungi are known, both on *Triodia* s. lat.: *Ustilago altilis* H. Sydow and *U. triodiae* K. Vánky (for descriptions and illustrations see Vánky, 1997:166-172). Recently, a different smut fungus was collected by A. A. Mitchell. It is described as:

---

* Part 146 in the series "Studies in Heterobasidiomycetous fungi" from the Botanical Institute, University of Tübingen.

Ustilago inaltilis K. Vánky & A. A. Mitchell, **sp. nov.**

Typus in matrice *Triodia longiloba* Lazarides, Australia, Western Australia, N. Kimberley, Galvins Gorge, 16°48'00" S, 125°50'36" E, 6.VI.1996, leg. A. A. Mitchell (4445). Holotypus in Herbario Ustil. Vánky (HUV 18345), isotypi in PERTH and BPI.

Sori intumescentiae caulium pustuliformes, 1–5 mm latae, longitudine cm nonnullorum, propter confluentiam saepe caulem circumdantes, plerumque internodia distalia occupantes usque ad caulem floralem sese extendentes, tantum gregibus spicularum plus-minus abortarum producentem. Sori primo epidermide sicut membrana tenui, cinerea cooperti, illa irregulariter rupta massam sporarum nigram, pulveream ostendentes. Sporae globosae, subglobosae usque late ellipsoidales, saepe parum irregulares, raro elongatae, 5,5–8(–9) x (5,5–)6–9,5 (–10,5) µm, forma variae (sporae globosae vel subglobosae diametro 5,5–9 µm), mediocriter atro-chocolatabrunneae; pariete 1–2(–2,5) µm crasso, dense, prominenter verrucoso, quod in imagine obliqua sporarum bene conspicuum.

Sori (Fig. 1) as blister-like, 1–5 mm wide, several cm long swellings on the stems, by confluence often surrounding the stem, usually comprising the distal internodes extending to the floral stem, on which only groups of more or less aborted spikelets are developing. Sori first covered by the epidermis as a thin, grey membrane which ruptures irregularly, disclosing the black, dusty mass of spores. Spores (Figs. 3, 4) globose, subglobose to broadly ellipsoidal, often slightly irregular, rarely elongated, 5.5–8(–9) x (5.5–)6–9.5(–10.5) µm, variable in size (globose or subglobose spores 5.5–9 µm in diameter), medium dark chocolate-brown; wall 1–2(–2.5) µm thick, densely, prominently verrucose which just affects the spore profile.

The spores of *Ustilago inaltilis* resemble but are smaller than those of *U. altilis* which measure 7–11 x 7–12 µm. The sori of *U. inaltilis* are long and relatively narrow compared to the sori of *U. altilis* which are short and thick. Futhermore, *U. inaltilis* leaves more or less aborted spikelets on the infected shoots whereas *U. altilis* leaves no trace of an inflorescence (see *U. altilis* in Vánky, 1997:168, fig. 21).

Etymology: Sydow, describing *U. altilis* (= fattened), certainly referred to the thick, swollen sori; *inaltilis* (= not fattened), refers to the comparatively narrow, not swollen sori.

Key to the smut fungi (*Ustilago*) of *Triodia*

1. Spores sparsely, finely echinulate, in SEM, between the spines minutely verruculose .... *U. triodiae*
– Spores densely, prominently verrucose 2
2. Spores 7–12 µm long. Sori short, thick. No trace of an inflorescence ... *U. altilis*
– Spores (5.5–)6–9.5(–10.5) µm long. Sori relatively long, thin. More or less aborted inflorescence is present .... *U. inaltilis*

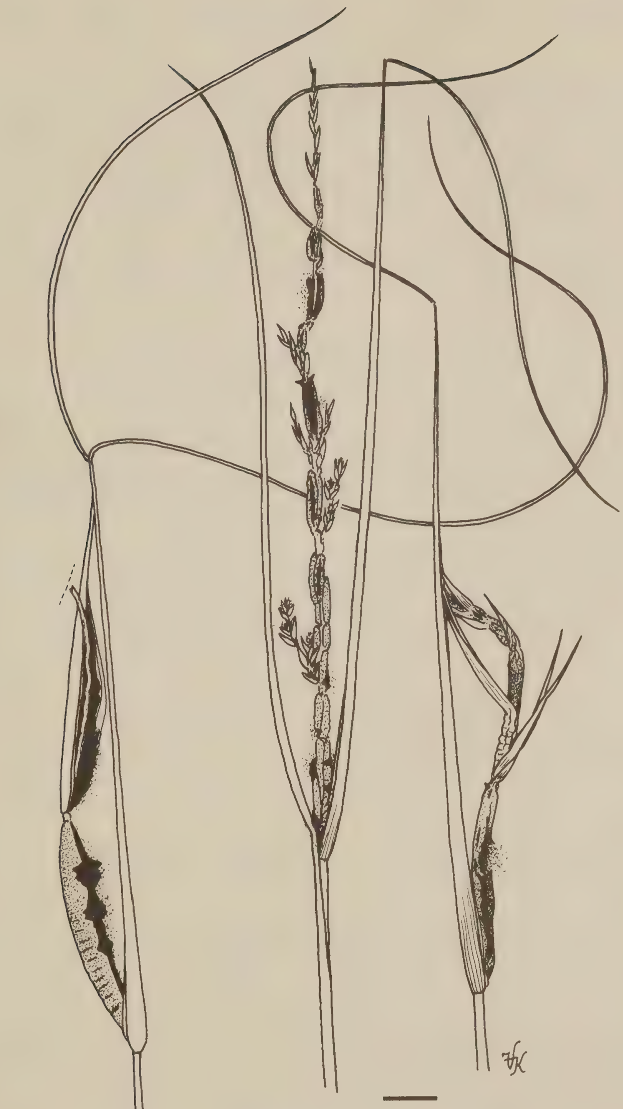


Fig. 1. Sori of *Ustilago inaltilis* K. Vánky & A. A. Mitchell on the stems, including the inflorescence axis of *Triodia longiloba* Lazarides (type).
Bar = 1 cm.

THE SMUT FUNGI OF *PSEUDORAPHIS* AND *CHAMAERAPHIS* (GRAMINEAE)

A peculiar smut fungus was recently collected in Papua New Guinea by R. G. Shivas and A. A. Mitchell on *Pseudoraphis spinescens* (R. Br.) Vickery. Subsequently, I revised the smut fungi of *Pseudoraphis* (with 6 known species) and of the closely related, monotypic *Chamaeraphis*. These "anomalous genera", adapted to marshy habit, belong to the subfam. *Panicoideae*, tribe *Paniceae*, subtribe *Cenchrinae* (Clayton & Renvoize, 1986:302), and are distributed from India, through Indonesia, to Australia. Only two smut fungi are known on species of *Pseudoraphis* and *Chamaeraphis*: *Ustilago confusa* Massee and *Sorosporium chamaeraphis* H. Sydow.

Ustilago confusa Massee, in Cooke, 1892:65.

Type on *Panicum paradoxum* R. Br. (= *Pseudoraphis paradoxa* (R. Br.) Pilger), Australia, Victoria.

"Sori produced in the ovary, soon naked, mass of spores pulverulent, violet-black; spores clear brown, with a tinge of violet by transmitted light, epispore about 1 μ thick, perfectly smooth, subglobose, or irregularly angular (11–14 μ)" (Massee, in Cooke, 1892:65).

Material not seen and it is not known where the type is deposited. McAlpine (1910:154) wrote that it is not at the Royal Gardens, Kew. The description is taken from the original. Of all smut fungi, violet colour of the spores is typical only for species of Microbotryaceae, parasitising dicotyledonous host plants (comp. Vánky, 1998). No smut fungus with violet spores is known on monocotyledonous plants. Consequently, either the statement of the violet colour is incorrect or the fungus is not a smut.

On Gramineae: *Pseudoraphis paradoxa* (R. Br.) Pilger (*Panicum paradoxum* R. Br.; *Chamaeraphis paradoxa* (R. Br.) Poiret), Australia (see the type).

The second known smut fungus of this group of grasses is *Sorosporium chamaeraphis* H. Sydow. It shows characters of a *Sporisorium*.

Sporisorium chamaeraphis (H. Sydow) K. Vánky, **comb. nov.**

Basionym: *Sorosporium chamaeraphis* H. Sydow, in Sydow & Petrak, Ann. Mycol. 26:431, 1928. — Syntypes on *Chamaeraphis muricata* (L. fil.) Merr. (= *C. aspera* (König) Nees = *Pseudoraphis spinescens* (R. Br.) Vickery), Philippine Islands, Luzon, Pampanga Prov., Porac, X.1923, coll. M. S. Clemens (4617); P. I., Luzon, Manila, Del Norte, 12.X.1923, coll. M. S. Clemens (3040; BPI 179536; it represents another fungus!; see below).

Sori in the inflorescence, entirely destroying it, 2–3 x 10–20 mm, partially concealed by the uppermost leaf sheath, at first covered by a brownish peridium which flakes away revealing a dark brown, first agglutinated later granular-powdery mass of spore balls intermixed with long, filiform columellae. Spore balls (Figs. 16, 17) subglobose, ellipsoidal or elongated, rarely irregular, 30–50

(–60) x 30–70(–80) µm, dark reddish-brown, composed of 15 to 100 or more, rather easily separating spores. Spores (Figs. 16, 17) usually subpolyhedrally irregular, more rarely subglobose or broadly ellipsoidal, 7–11 x 9–13 (–14) µm, yellowish-brown to reddish-brown; wall slightly uneven, 1–1.5 µm thick, thickest at the angles, finely, densely punctate, on the free surface of the peripheral spores in a ball finely, densely verrucose-echinulate which causes the spore profile to appear finely wavy to finely serrulate. No sterile cells could be seen.

On Gramineae: *Pseudoraphis spinescens* (R. Br.) Vickery (*Chamaeraphis spinescens* (R. Br.) Poiret; *C. muricata* (L. fil.) Merr.), Australia, Philippines.

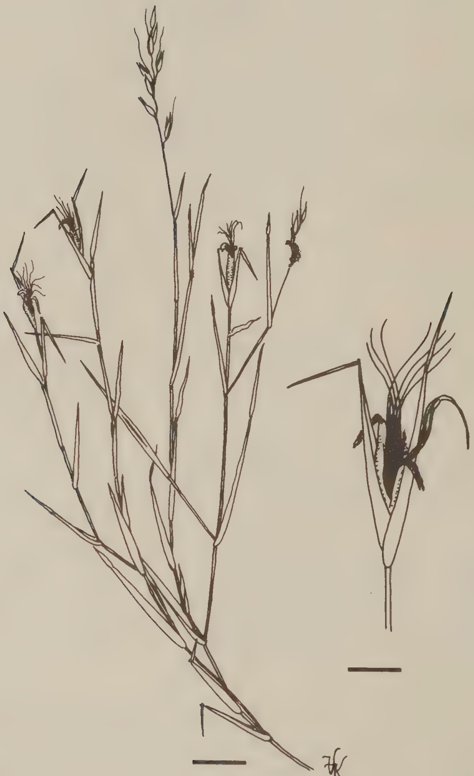
In absence of the type, the description above is based on the original, and on several collections.

When Sydow described *Sorosporium chamaeraphis* he mentioned two collections (see above), without indicating a type. Only one of the two syntypes (or part of it) could be located, the one preserved in BPI (179536!). It is not known where the other syntype (or part of it) is deposited. Probably it was lost in the fire in Berlin in 1943. The problem is, that the existing syntype does not fit with the protologue of *S. chamaeraphis*; it represents another *Sporisorium* species (see below), producing sori identical with *S. chamaeraphis* but having larger, thick-walled, rounded spores. Consequently, the BPI 179536 sample cannot be designated as the lectotype of *S. chamaeraphis*. If the other syntype, on which *S. chamaeraphis* was described, is lost, a neotype must be designated. The existence of a second smut fungus, which destroys the whole inflorescence of *Pseudoraphis*, could be confirmed also by the study of further collections of smutted *Pseudoraphis*. It is described as:

Sporisorium pseudoraphis K. Vánky, **sp. nov.**

Typus in matrice *Pseudoraphis spinescens* (R. Br.) Vickery, Philippine Islands, Luzon, Manila, 8.VI.1921, leg. A. S. Hitchcock. Holotypus in BPI 170537! Paratypus in matrice *Pseudoraphis spinescens*, P. I., Luzon, Manila, Del Norte, 12.X.1923, leg. M. S. Clemens, 3040 (BPI 179536!; as syntype of *Sorosporium chamaeraphis* H. Sydow on *Chamaeraphis muricata* (L. fil.) Merr.).

Sori sicut in *Sporisorium chamaeraphis*, inflorescentiam totam destruentes, 2–3 x 10–20 mm, a vagina folii supremi obtecti, primo peridio brunneolo cooperti, illo resoluto massam atrobrunneam primo agglutinatam, serius granuloso-pulveream glomerulorum sporarum cum columellis longis, filiformibus intermixtam ostendentes. Glomeruli sporarum globosi, ellipsoidales, ovoidei vel elongati, 30–60(-70) x 35–80(–100) µm, atro-rubrobrunnei, e sporis 10–50 (vel plus?) facile separabilibus compositi. Sporae globosae, subglobosae, ellipsoidales vel parum irregulares, 10–15 x 11–16(–17) µm, rubrobrunneae; pariete inaequali, 1–2,5 µm crasso, sporae internae subtiliter, dense punctato-verruculosae, superficies libera sporarum externarum subtiliter verrucoso-echinulata, proptera linea suprema sporarum parum subtiliter undulata usque serrulata apparens. Cellulae steriles paucae, 10–16 µm longae, hyalinae, in catervis irregularibus; pariete 1,5–2,5 µm crasso, levi.



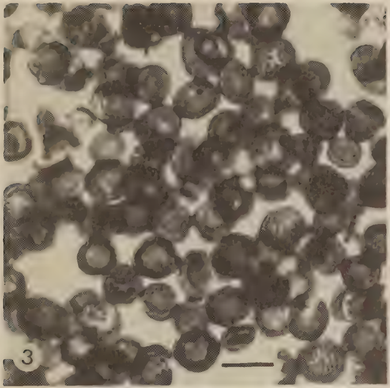
2

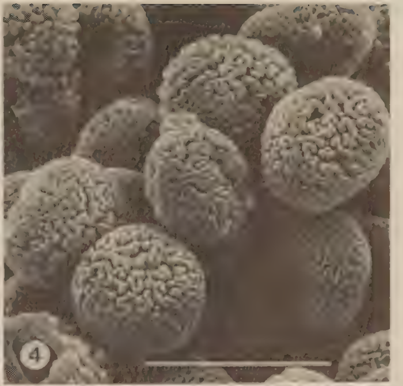
Fig. 2. Sori of *Sporisorium pseudoraphis* K. Vánky in the inflorescences of *Pseudoraphis spinescens* (R. Br.) Vickery. An inflorescence escaped infection completely, another one partially. Enlarged a sorus with the filiform columellae and remnants of the peridium (type). Bars = 1 cm and 5 mm, respectively.

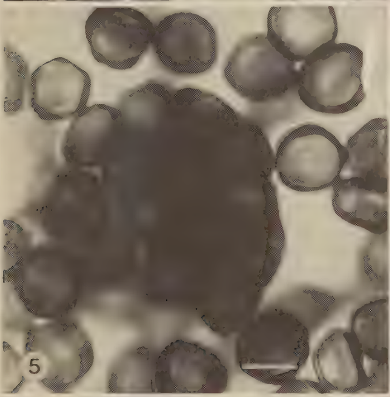
Figs. 3, 4. Spores of *Ustilago inaltilis* K. Vánky & A. A. Mitchell in LM and in SEM (type).

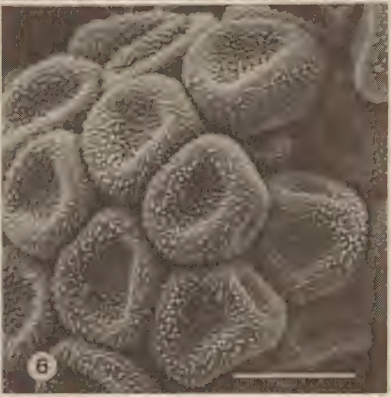
Figs. 5, 6. Spore balls and spores of *Sporisorium pseudoraphis* K. Vánky in LM and in SEM (type).

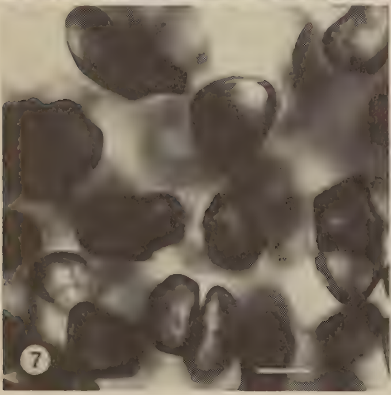
Figs. 7, 8. Spore balls and spores of *Sporisorium anthracoideisporum* K. Vánky & R. G. Shivas in LM and in SEM (type). Bars = 10 µm.

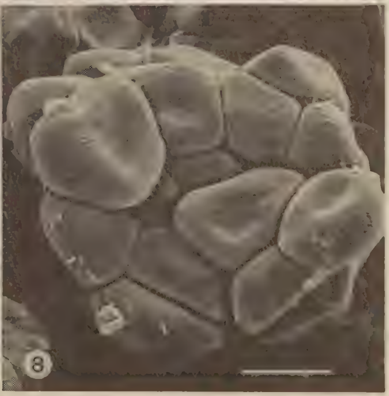

3

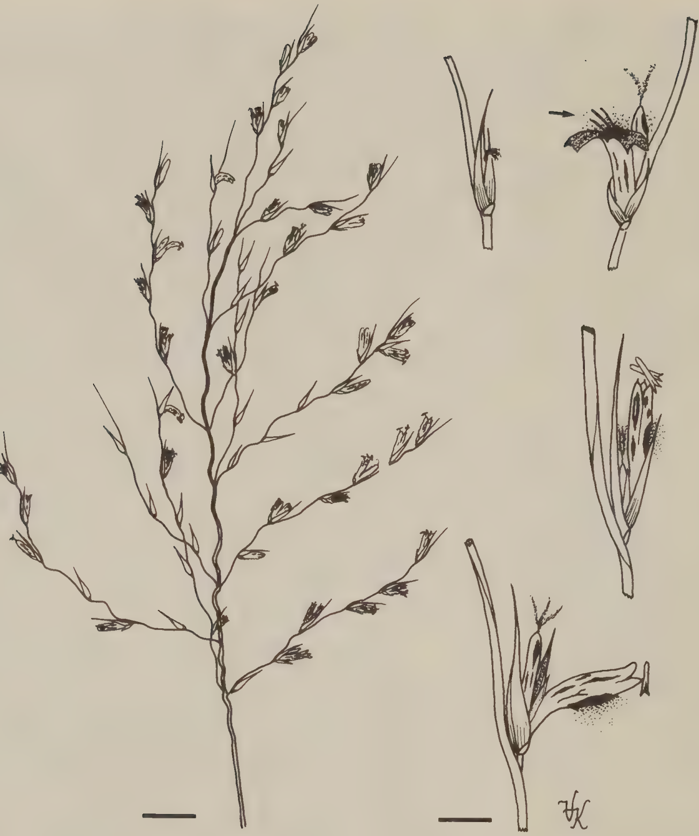

4


5


6


7


8



9

Fig. 9. Sori of *Sporisorium anthracoideisporum* K. Vánky & R. G. Shivas in the florets of some of the spikelets of an inflorescence of *Pseudoraphis spinescens* (R. Br.) Vickery (type). Enlarged a healthy and three infected spikelets in which both male and female florets are transformed into sori. The distal part of those sori, originating from the lower, male florets, is more or less tripartite, in young stage bearing aborted anthers. In these sori there are 3 columellae (arrow), corresponding to the three filaments. The sori developed from the upper, female florets are usually subacute, with a stunted stigma and have only one columella, corresponding to the style.

Bars = 1 cm and 2 mm, respectively.

Sori (Fig. 2) as in *Sporisorium chamaeraphis*, destroying the whole inflorescence, 2–3 x 10–20 mm, partially concealed by the uppermost leaf sheath, at first covered by a brownish peridium which flakes away revealing a dark brown, first agglutinated later granular-powdery mass of spore balls intermixed with long, filiform columellae. Spore-balls (Figs. 5, 6) globose, ellipsoidal, ovoid or elongated, 30–60(–70) x 35–80(–100) µm, dark reddish-brown, composed of 10–50 (or more?), easily separating spores. Spores (Figs. 5, 6) globose, subglobose, ellipsoidal or slightly irregular, 10–15 x 11–16(–17) µm, reddish-brown; wall uneven, 1–2.5 µm thick, inner spores finely, densely punctate-verruculose, the free surface of the outer spores finely verrucose-echinulate, causing the spore profile to appear finely wavy to serrulate. Sterile cells few, 10–16 µm long, hyaline, in irregular groups; wall 1.5–2.5 µm thick, smooth.

On Gramineae: *Pseudoraphis spinescens* (R. Br.) Vickery (*Chamaeraphis spinescens* (R. Br.) Poiret; *C. muricata* (L. fil.) Merr.; *C. aspera* (König) Nees), Philippine Islands.

Sporisorium pseudoraphis has larger, more regular, darker spores with thicker spore wall than those of *S. chamaeraphis* (compare figs. 5, 6 with those of 16, 17, but obs. the different long bars of the SEM pictures).

The smut fungus collected recently in Papua New Guinea differs markedly from the three smut fungi presented above. On members of the remaining 11 grass genera of the subtribe *Cenchrinae* (given by Clayton & Renvoize, 1986), smut fungi are known on species of *Anthephora* (2 spp.), *Cenchrus* (6 spp.), and *Pennisetum* (19 spp.). The fungus from Papua New Guinea also differs from these smuts. It has characters of a *Sporisorium* but the spores have an unusual morphology for a *Sporisorium*, namely they resemble spores of an *Anthracoidea* (Ustilaginales) but without any relationship to that genus. It is described as:

Sporisorium anthracoideisporum K. Vánky & R. G. Shivas, **sp. nov.**
Typus in matrice *Pseudoraphis spinescens* (R. Br.) Vickery (*Chamaeraphis spinescens* (R. Br.) Poiret), Papua New Guinea, Western Province, at Bensbach River, 13.IV.1997, leg. R. G. Shivas & A. A. Mitchell (4686). Holotypus in Herbario Ustil. Vánky (HUV 18350!), isotypi in PNG 16593, BRIP and BPI.

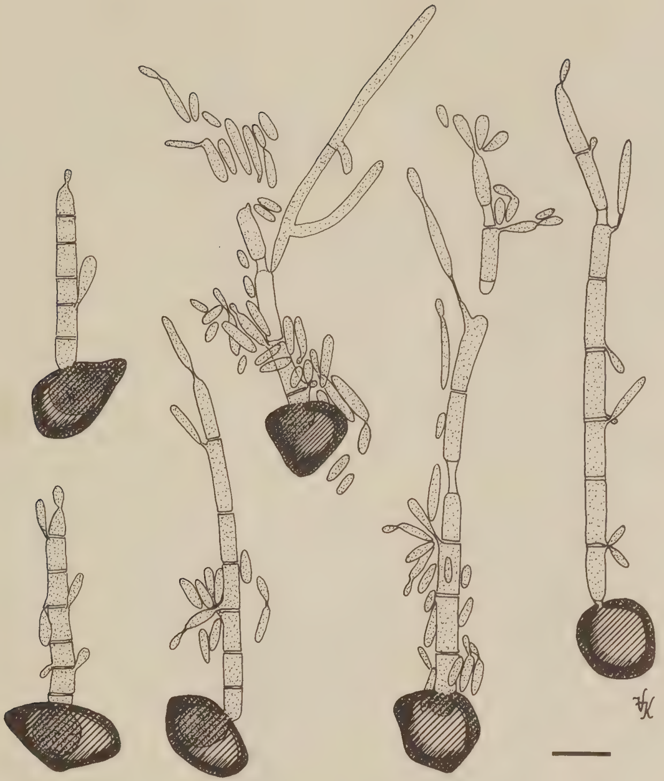
Sori in flosculis utrisque spicularum nonnullarum vel omnium eiusdem inflorescentiae, cylindrici, 0,5–1,5 x 2–6 mm, forte parum curvati, primo peridio tenui, argenteo usque cinereo cooperti, ipso longitudinaliter in plures partes, et in latere et/vel in apice sori rupto, massam glomerulorum sporarum nigrobrunneam, pulveream, sporas columellamque centralem unam vel tres illas filiformes vel taeniaeformes, in soris longitudinales, e telis matricalibus et hyphis eas penetrantibus compositas ostendentes. Glomeruli sporarum rotundati usque elongati vel irregulares, e sporis paucis usque multis constructi, 20–100 µm longi, atro-rubrobrunnei, opaci, in sporas singulas facile dissoluti. Sporae forma et magnitudine extraordinarie variae, subpolyedricae, elongatae, irregulares, raro subapiculatae vel sphaericae, (8–)9–13(–16) x (9,5–)11–22(–25) µm, atro-rubro-brunneae; pariete irregulariter incrassato, 0,5–1,5 µm, in angulis usque 2,5 µm crasso, sub LM levi valde subtiliter punctato, sub SEM subtiliter, varie dense verruculoso. Cellulae fungales peridii catenulatae, cellulae singulae subcylindricae, rotundatae vel parum irregulares, diametro 5–10 µm, hyalinae; pariete uniformi, tenui (cca. 0,5 µm), levi. Germinatio sporarum cum basidiis 4–8-cellularubus, 2,5–3 x 50–90 µm. Ad basidia lateraliter et terminaliter in sterigmatibus basidiosporae ovoideae usque longe ellipsoidales, 1–2 x 3–15 µm productae. Raro etiam hyphae ramificatae, cca. 2,5 µm latae ad basidia productae. In mediis culturae basidiosporae colonias fermenti cellularum basidiosporis similium producentes.

Sori (Fig. 9) in both florets of some or all spikelets of an inflorescence, cylindrical, 0.5–1.5 x 2–6 mm, sometimes slightly curved, first covered by a thin, silvery to grey peridium which splits longitudinally, on several places, both on the side and/or from the apex of the sori, disclosing the blackish-brown, powdery mass of spore balls, spores and one or three, filiform or band-like, central columellae of the length of the sori, composed of host tissues permeated by hyphae. Spore balls (Figs. 7, 8) rounded to elongated or irregular, composed of few to many spores, 20–100 µm long, dark reddish-brown, opaque, easily disintegrating into single spores. Spores (Figs. 7, 8) extremely variable in shape and size, subpolyhedral, elongated, irregular, rarely subapiculate or spherical, (8–)9–13(–16) x (9.5–)11–22(–25) µm, dark reddish-brown; wall irregularly thickened, 0.5–1.5 µm, at the angles up to 2.5 µm thick, in LM smooth or very finely punctate, in SEM finely, variably densely verruculose. Fungal cells of the peridium in chains, single cells subcylindrical, rounded or slightly irregular, 5–10 µm in diameter, hyaline, wall uniform, thin (c. 0.5 µm), smooth. Spore germination (Fig. 10; on water-agar, at room temp., after 3 days) results in 4–8-celled basidia measuring 2.5–3 x 50–90 µm. On the basidia, laterally and terminally, on sterigmata, ovoid to long ellipsoidal basidiospores are produced measuring 1–2 x 3–15 µm. Rarely also ramifying, c. 2.5 µm wide hyphae are developing on the basidia. In culture media, basidiospores give rise to yeast colonies of cells similar to the basidiospores.

On Gramineae: *Pseudoraphis spinescens* (R. Br.) Vickery. Known from the type collection only.

Key to the smut fungi of *Pseudoraphis* and *Chamaeraphis*

1. Sori in the whole inflorescence 2
– Sori in the florets or ovaries 3
2. Spores 9–13(–14) µm long, mostly subpolyhedral; wall 1–1.5 µm thick ....
....*Sporisorium chamaeraphis*
– Spores 11–17 µm long, mostly rounded; wall 1–2.5 µm thick..........................
....*Sporisorium pseudoraphis*
3. "Spores 11–14 µm long, clear brown with a tinge of violet".... *Ustilago confusa*
– Spores 9.5–25 µm long, dark reddish-brown .. *Sporisorium anthracoideisporum*

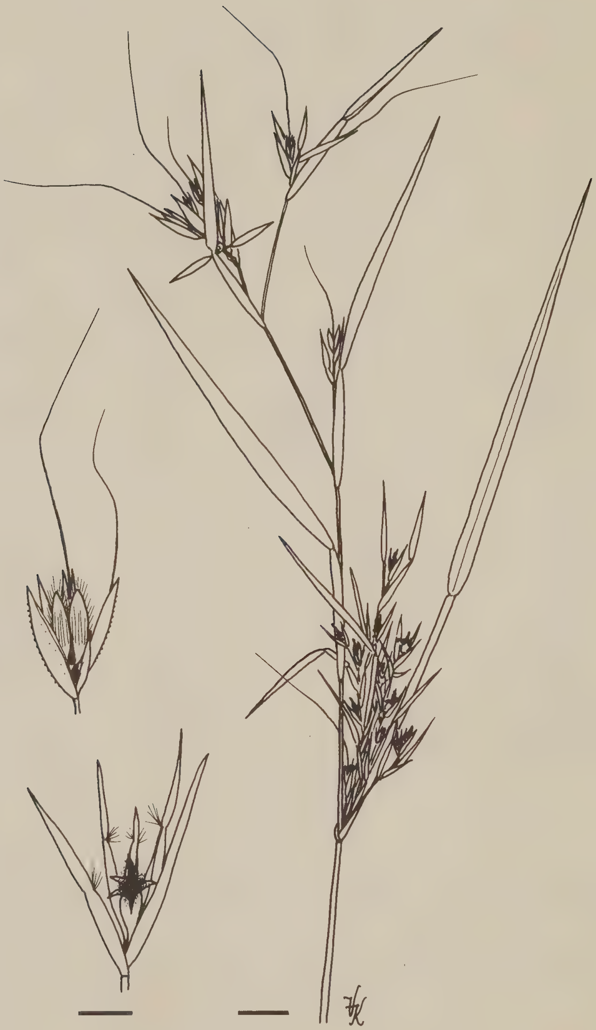


10

Fig. 10. Germinating spores of *Sporisorium anthracoideisporum* K. Vánky & R. G. Shivas (type; on water-agar, at room temp., in 3 days), resulting in 4–8-celled basidia on which laterally and terminally basidiospores, rarely also ramifying hyphae are produced. Bar = 10 µm.

A NEW *SPORISORIUM* ON *ISEILEMA* (GRAMINEAE)

Iseilema (subfam. Panicoideae, tribe Andropogoneae, subtribe Anthistiriinae) is a genus of c. 20 species, distributed from India to Australia (Clayton & Renvoize, 1986:360). On these five smut fungi have been described (comp. Vánky, 1996:104-106 and 1997:151). Recently, an additional smut fungus was collected in Australia.



11

Fig. 11. *Sporisorium iseilematis-ciliati* K. Vánky on *Iseilema ciliatum* C. E. Hubb., producing "witches' broom" like, congested, infected racemes. Enlarged a healthy raceme and a sorus, replacing a raceme (type).
Bars = 1 cm and 5 mm, respectively.

Sporisorium iseilematis-ciliati K. Vánky, **sp. nov.**

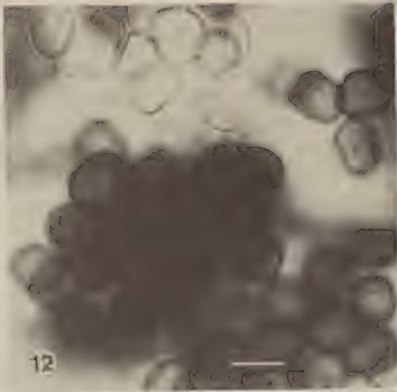
Typus in matrice *Iseilema ciliatum* C. E. Hubb., Australia, Western Australia, cca. 200 km S. oppid. Kununurra, Denison Plains, Gordon Downs, 18°45'12''S, 128°34'42''E, 30.III.1997, leg. T. F. Jubb (4537B), comm. A. A. Mitchell. Holotypus in Herbario Ustil. Vánky (HUV 18360!), isotypi in PERTH et in BRI.

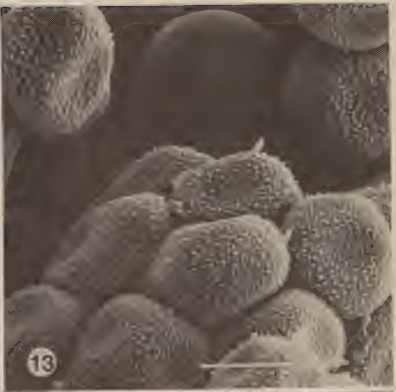
Sori in toto racemo, in inflorescentia scoparie agglomerati, sori singuli ovoidei vel cylindrici, 1–2 x 3–6 mm, primo peridio crasso, brunneolo cooperti, quo ab apice dehiscenti massam atrobrunneam, pulveream glomerulorum sporarum, sporas, cellulas steriles et columellam simplicem, centralem ostendentes. Glomeruli sporarum laxi, pleospori, in sporas singulas facile separati. Sporae subglobosae, late ellipsoidales usque parum irregulares, subpolyedricae, 8–10,5 x 9,5–13 µm, flavidobrunneae; pariete aequali, 0,5–1 µm crasso, subtiliter, dense punctato-verruculoso. Germinatio sporarum basidiis 4-cellularibus, magnitudine 2–3 x 28–40 µm, lateraliter et apicaliter in sterigmatibus brevibus basidiosporas multas ovoideas usque longe ellipsoidales, 1,5–2,5 x 4–8(–12) µm continuo germinantes, colonias fermenti efficientes producentibus. Cellulae steriles singulae, binae vel in catervis irregularibus, globosae, ovoideae vel irregulares, cum latere unico vel lateribus duobus deplanatis, 7–14 x 8–16 µm, subhyalinae; pariete 1–2 µm crasso, levi.

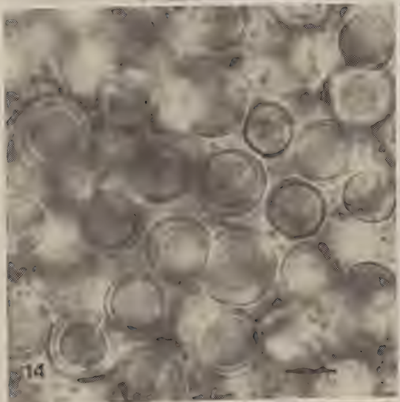
Sori (Fig. 11) comprise the whole raceme, these agglomerated in witches' brooms within the inflorescence, single sori ovoid or cylindrical, 1–2 x 3–6 mm, first covered by a thick, brownish peridium which dehisces from its apex disclosing the dark brown, powdery mass of spore balls, spores, sterile cells and a simple, central columella. Spore balls loose, many-spored, easily separating into single spores. Spores (Figs. 12, 13) subglobose, broadly ellipsoidal to slightly irregular, subpolyhedral, 8–10.5 x 9.5–13 µm, yellowish-brown; wall even, 0.5–1 µm thick, finely, densely punctate-verruculose. Spore germination (Fig. 18; on WA, at room temp., in 2 days) results in 4-celled basidia, measuring 2–3 x 28–40 µm, on which laterally and apically, on short sterigmata, numerous ovoid to long ellipsoidal basidiospores of 1.5–2.5 x 4–8(–12) µm are produced which bud successively, developng yeast colonies. Sterile cells (Figs. 12, 13) single, in pairs or in irregular groups, globose, ovoid or irregular with one or two flattened sides, 7–14 x 8–16 µm, subhyaline; wall 1–2 µm thick, smooth.

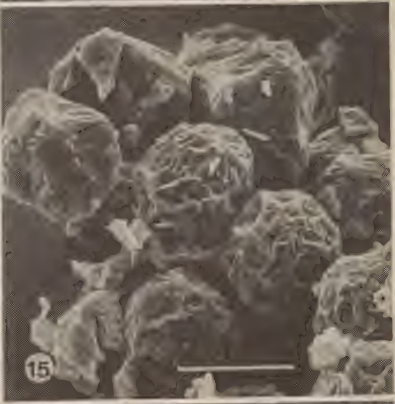
Key to the smut fungi (*Sporisorium*) of *Iseilema*

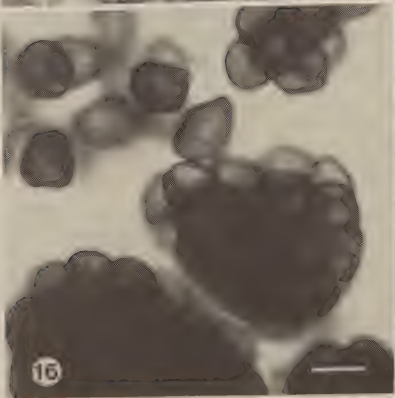
1. The fungus produces witches' brooms 2
– The fungus does not produce witches' brooms 3
2. Sori 10–15 mm long, spore balls semi-permanent, dimorphic (i.e. outer and inner spores different) .... *S. thirumalacharii*
– Sori 3–6 mm long, spore balls ephemeral, not dimorphic .... *S. iseilematis-ciliati*
3. Sori in the spikelets of some racemes of an inflorescence .... *S. inayati*
– Sori in all racemes of an inflorescence 4
4. Spores 5.5–7(–8) µm long, sparsely, finely verrucose .... *S. iseilematis-prostrati*
Spores 7–10 µm long, finely echinulate .... *S. iseilematis*
– Spores 9–13.5 µm long, prominently echinulate .... *S. mitchellii*

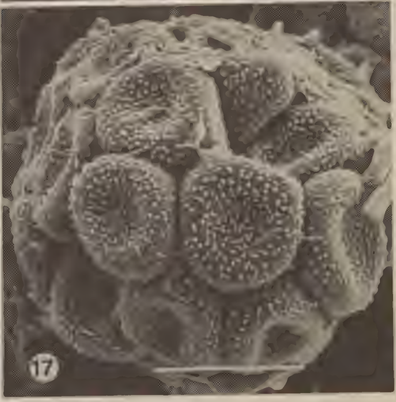

12

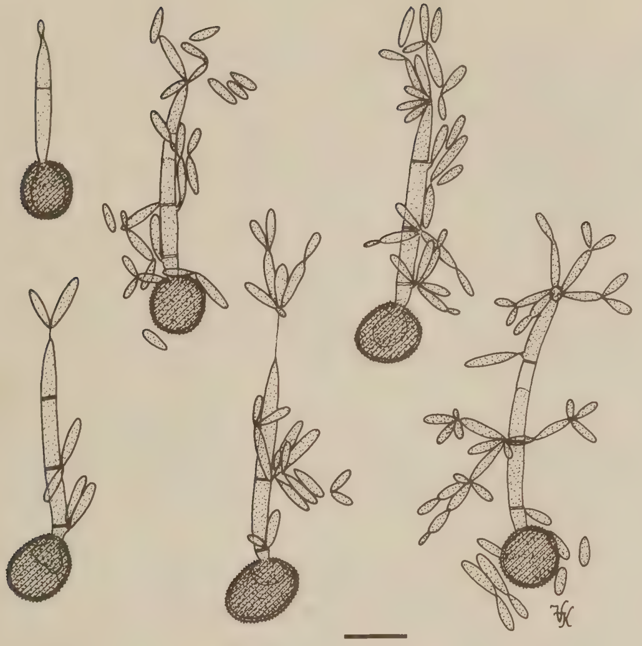

13


14


15


16


17



18

Fig. 18. Germinating spores of *Sporisorium iseilematis-ciliati* K. Vánky, with septate, 4-celled basidia on which, laterally and apically, on short sterigmata, ovoid to long ellipsoidal basidiospores are produced which bud (on water-agar, at room temp., in 2 days; type). Bar = 10 µm.

Figs. 12, 13. Spore balls, spores and sterile cells of *Sporisorium iseilematis-ciliati* K. Vánky in LM and in SEM (type).

Figs. 14, 15. Spores of *Entorrhiza casparyanella* K. Vánky in LM and in SEM (type).

Figs. 16, 17. Spore balls and spores of *Sporisorium chamaeraphis* (H. Sydow) K. Vánky in LM and in SEM from *Pseudoraphis spinescens* (R. Br.) Vickery, Australia, New South Wales, W. of Corowa, I.1906, coll. Pescott (VPRI 2962, as *Sorosporium panici-miliacei*). Bars = 10 µm.

A NEW SPECIES OF *ENTORRHIZA*

Species of *Entorrhiza* produce galls on the roots of Cyperaceae and Juncaceae. They have a peculiar type of germination (comp. Fineran, 1982). Based on ultrastructural and molecular biological data, the genus has a basal position within the Ustilaginomycetes and was classified into the Subcl. Entorrhizomycetidae R. Bauer & Oberw., Ord. Entorrhizales R. Bauer & Oberw., Fam. Entorrhizaceae R. Bauer & Oberw. (Bauer & al., 1997; Begerow et al., 1997). Eight species of *Entorrhiza* are known: **1**. *E. aschersoniana* (Magnus) Lagerh., **2**. *E. caricicola* Ferd. & Winge, **3**. *E. casparyana* (Magnus) Lagerh., **4**. *E. cypericola* (Magnus) C. Weber, **5**. *E. finerani* K. Vánky, **6**. *E. parvula* K. Vánky, **7**. *E. raunkiaeriana* Ferd. & Winge, and **8**. *E. scirpicola* (Correns) Sacc. & P. Sydow. Between specimens of *Entorrhiza*, obtained from the late Dr. Judith M. Fineran (Christchurch, New Zealand) there is a further, new species:

Entorrhiza casparyanella K. Vánky, **sp. nov.**

Typus in matrice *Juncus gregiflorus* L. Johnson (Juncaceae), New Zealand, South Island, Canterbury, between Pigeon Bay and Port Levy, IX.1970, leg. J. M. Fineran. Holotypus in Herbario Ustil. Vánky (HUV 14794!), isotypus in CANU 16006 (sub. *E. casparyana*).

Sori gallae radicis, simplices, digitati vel multiramosi, cca. 1–2 x 3–10 mm, sporis intracellulariter evolutis impleti. Sporae globosae vel subglobosae, solitariae, raro binae, aliquando appendice brevi, hyphali, 10–16 x 10–16(–17) µm, subhyalinae usque flavae; pariete bistratoso, strato interno aequali, cca. 0,8 µm crasso, strato externo aequali vel non aequali, crassitudine valde vario, plerumque 1–2(–2,5) µm crasso, in sporis nonnullis conspicue absenti, in aliis 2,5–5 µm crasso, levi vel parum undulato, sub SEM levi usque irregulariter scabroso.

Sori (see Fineran, 1971:496, fig. 2) as root galls, simple, digitate or much branching, ca. 1–2 x 3–10 mm, filled with intracellularly developing spores. Spores (Figs. 14, 15) globose or subglobose, solitary, rarely in pairs, sometimes with a short hyphal appendage, 10–16 x 10–16(–17) µm, subhyaline to yellow; wall two-layered, inner layer equal, c. 0.8 µm thick, outer layer equal or unequal, very variable in thickness, usually 1–2(–2.5) µm thick, in some spores apparently absent, in others 2.5–5 µm wide, smooth or slightly undulate, in SEM smooth to irregularly roughened.

Etymology: *casparyanella*, diminutive of *casparyana*, allusion to the much smaller spores of this species, than those of *Entorrhiza casparyana*.

Key to the known *Entorrhiza* species

1. Spores globose or subglobose. 2
– Spores ellipsoidal or subellipsoidal 3
2. Spore diam. 12–28 µm, exospore 1–10 µm thick, tuberculate or verrucose, occasionally smooth. On *Juncus* .... *E. casparyana*
– Spore diam. 10–17 µm, exospore 1–5 µm thick, smooth or undulate. On *Juncus* .... *E. casparyanella*
3. Spore wall almost smooth. On *Carex, Eleocharis, Juncus* .... *E. caricicola*
– Spore wall evidently ornamented 4
4. Spore wall with ridges 5
– Spore wall otherwise ornamented 8
5. Ridges parallel to the long axis of the spore 6
– Ridges usually obliquely oriented 7
6. Spores 15–30 µm long, with well-developed papillae, wall 2–5 µm thick, with coarse ridges. On *Scirpus* .... *E. fineraniae*
– Spores 12–20 µm long, without papillae, wall 0.8–1 µm thick, with faint, irregular ridges. On *Eleocharis* .... *E. parvula*
7. Spores subglobose to ellipsoidal, ridges coarse, interrupted, branching. On *Eleocharis* .... *E. scirpicola*
– Spores elongate-ellipsoidal or lemon-shaped, ridges faint, usually in spiral lines. On *Scirpus* .... *E. raunkiaeriana*
8. Spore wall distinctly verruculose. On *Juncus* .... *E. aschersoniana*
– Spore wall rugulose-undulate. On *Cyperus* .... *E. cypericola*

ACKNOWLEDGEMENTS

I am grateful to Dr. S. Tóth (Gödöllő, Hungary) for providing the Latin descriptions, to Professor H. Scholz (Berlin, Germany) for serving as pre-submission reviewer, to Dr. R. G. Shivas and Mr. A. A. Mitchell (both from Perth, Australia) for numerous smut fungus collections, for reading the manuscript and for identifying several host plant species. My sincere thanks to the Director and Curator of the Herbarium BPI (Beltsville, USA) for loan of specimens. The technical assistance of Mr. H. Schoppmann with SEM, and of Mr. F. Albrecht with photographic work is kindly acknowledged.

LITERATURE CITED

Bauer, R., Oberwinkler, F. & Vánky, K. 1997. Ultrastructural markers and systematics in smut fungi and allied taxa. – Canad. J. Bot. 75:1273-1314.

Begerow, D., Bauer, R. & Oberwinkler, F. 1997. Phylogenetic studies on nuclear LSU rDNA sequences of smut fungi and related taxa. – Canad. J. Bot. 75 (in press).

Clayton, W. D. & Renvoize, S. A. 1986. Genera graminum. Grasses of the world. – London, 389 pp.

Cooke, M. C. 1892. Australian fungi. – Grevillea 20:65.

Fineran, J. M. 1971. *Entorrhiza* C. Weber (Ustilaginales) in root nodules of *Juncus* and *Scirpus* in New Zealand. – New Zealand J. Bot. 9:494-503.

--- 1982. Teliospore germination of *Entorrhiza casparyana* (Ustilaginales). – Canad. J. Bot. 60:2903-2913.

McAlpine, D. 1910. The smuts of Australia, etc. – Melbourne, 285 pp.

Sydow, H. & Petrak, F. 1928. Micromycetes philippinenses. Series prima. – Ann. Mycol. 26:414-446.

Vánky, K. 1996. Taxonomical studies on Ustilaginales. XIV. – Mycotaxon 59:89-113.

--- 1997. New Ustilaginales from Australia. – Mycotaxon 62:151-174.

--- 1998. The genus *Microbotryum* (smut fungi). – Mycotaxon (28 pp., in press).

MYCOTAXON

Volume LXVIII, pp. 345-393 July-September 1998

THE GENUS KRETZSCHMARIA

Jack D. Rogers and Yu-Ming Ju
Department of Plant Pathology
Washington State University
Pullman, Washington 99164-6430

ABSTRACT

Sixteen species of ***Kretzschmaria***—including taxa formerly considered as ***Ustulina***—are recognized. ***Kretzschmaria curvirima***, ***K. guyanensis***, ***K. megalospora***, ***K. milleri***, and ***K. zelandica*** are described as new. ***Kretzschmaria eriodendri***, ***K. macrosperma***, ***K. neocaledonica*** are new combinations. Cultural and anamorphic data are provided for some taxa. A key to species and an annotated list of published epithets are included. Three excluded ***Kretzschmaria*** taxa are newly combined with ***Xylaria***—***X. apoda***, ***X. heliscus***, and ***X. intracolorata***.

Key words: ***Kretzschmaria***, systematics, ***Ustulina***, ***Xylaria***, Xylariaceae

Kretzschmaria Fr. (misspelled as ***Kretschmaria***) was established on ***Sphaeria clavus*** Fr.: Fr. (Fries, 1849). The most important part of the diagnosis reads: “Conceptaculum carbonaceum, crassum, rigidum, stipitatum, capitatum, capitulo intus cavo, cellulis rotundatis amplis referti...” Up to the present, the general concept of ***Kretzschmaria*** has been much as Fries described it, i.e., a stipitate ascigerous stroma with interior flesh surrounding and beneath perithecia disintegrating. ***Ustulina*** Tul. & C. Tul. is based on ***U. vulgaris*** Tul. & C. Tul. [= ***U. deusta*** (Hoffm.: Fr.) Lind] which features a massive pulvinate stroma that becomes hollow at maturity. Martin (1970) recognized the great resemblance of this species to ***Kretzschmaria*** and transferred it as ***K. deusta*** (Hoffm.: Fr.) P. Martin. He transferred a number of other taxa to ***Kretzschmaria***, some of which we accept as members of other genera. Martin (1970) recognized the close relationship between ***Xylaria*** Hill *ex* Schrank and ***Kretzschmaria***, separating them on the vertical orientation of perithecia and umbonate or aristate sterile apex on the fertile parts of some species of the latter genus. Interestingly, ***K. clavus*** (Fr.: Fr.) Sacc.—the type species of the genus—does not have umbonate stromata (Martin, 1970).

An important paper supporting the acceptance of ***Ustulina*** as congeneric with ***Kretzschmaria*** was that of Ko et al. (1982). They believed that ***Kretzschmaria***-like and ***Ustulina***-like stromata represented forms of the same taxon, ***K. clavus***. Their evidence was based on ascospore measurements and colony morphology in agar culture. We have, in fact, reexamined stromata forwarded to JDR by W. H. Ko in 1980. In that case, the kretzschmarioid stromata are those of ***K. clavus*** and the ustulinoid stromata are those of ***K. pavimentosa*** (Ces.) P. Martin. As can be seen in descriptions of these taxa elsewhere herein, the ascospores are morphologically different and have length ranges that only slightly overlap. One of us (JDR) has repeatedly sought evidence that ***K. clavus*** grades into a ustulinoid form, but has found none. On the other hand, as will be discussed later, the culture colony morphologies of both kretzschmarioid and ustulinoid fungi—even some that are strongly dissimilar in the teleomorphic states—are very similar. Indeed, it is cultural features that have greatly influenced our decision to accept ***Kretzschmaria*** and ***Ustulina*** as morphological manifestations of one genus (but not of one species!).

In this treatment of ***Kretzschmaria*** we include taxa with the following characteristics:

1. Stromata that at first bear conidia uniformly overall (ustulinoid taxa) or on coremioid structures (some, perhaps all, kretzschmarioid taxa).
2. Mature stromata that have a carbonaceous outer layer encasing a rather soft white to blackish inner layer. Stromata becoming hollow as perithecia mature, finally forming brittle shells with perithecia attached.
3. Stromata that are attached to the substrate by definite stipes (kretzschmarioid taxa) or by scattered narrow connectives (ustulinoid taxa).
4. Stromata that are devoid of colored pigments in KOH.
5. Anamorph that is xylarioid, more or less assignable to ***Geniculosporium*** Chesters & Greenh. Not ordinarily produced in cultures of taxa that have been studied in culture.
6. Ascus rings that are higher than broad, usually massive and bluing in iodine (Melzer's reagent).
7. Ascospores that are more or less inequilateral with a germ slit on the flatter side. Perispore not dehiscent in KOH.
8. Cultures on 2% Oatmeal Agar (Difco) that soon become furrowed, distorted, and tend to separate from the culture plate.

ECOLOGY AND HOST-PARASITE RELATIONSHIPS

Kretzschmaria species, as exemplified by ***K. deusta***, cause white rots whereby both cellulose and lignin are utilized. A good description of the decay caused by ***K. deusta*** (as ***Ustulina vulgaris***) is given by Cartwright and Findlay (1950). Nilsson et al. (1989) subjected birch wood to decay by ***K. deusta*** (as ***Hypoxylon deustum*** (Hoffm.: Fr.) Grev.) and categorized it as causing Type 2 decay featuring cell wall erosion from the cell lumen outward. Schwarze et al. (1995) showed that ***K. deusta*** (as ***Ustulina deusta***) causes a soft-rot featuring cavity formation in the S2 layer of secondary cell walls. Hyphae appeared to move laterally between contiguous cells entirely by way of pits; typical bore holes apparently were absent. Sound wave transmission appeared to be little reduced in wood decayed by ***K. deusta*** and the authors concluded that the stress-wave timer cannot detect decay caused by this fungus (Schwarze et al., 1995). Decayed wood usually contains blackish sheets or sacs of hyphae that appear as black lines, so-called zone lines, in cuts (Cartwright and Findlay, 1950).

Kretzschmaria species are found throughout the temperate and tropical regions of the world. One species, ***K. deusta***, is most commonly encountered in the North Temperate Zone. Unfortunately, it is widely reported from the subtropics and tropics owing to its confusion with ***K. pavimentosa***, ***K. sandvicensis*** (Reichardt) J. D. Rogers & Y.-M. Ju, ***K. zonata*** (Lév.) P. Martin, and other predominantly tropical taxa. ***Kretzschmaria deusta*** is reported as especially common on ***Fagus*** L. in the British Isles (Cannon et al., 1985). Wilkins (1935, 1939b) has given a detailed account of its activities in England and a comprehensive review of the early literature (Wilkins, 1933). Campbell and Davidson (1940) discuss this fungus as causing butt rot of ***Acer negundo*** L., ***A. saccharum*** Marsh., ***Betula papyrifera*** Marsh., ***Fagus grandifolia*** Ehrh., and ***Ilex opaca*** Ait. Other host genera listed from the United States include ***Aleurites*** J. R. Forster & G. Forster, ***Alnus*** Mill., ***Citrus*** L., ***Liriodendron*** L., ***Nyssa*** L., ***Poncirus*** Raf., ***Quercus*** L., ***Tilia*** L., and ***Ulmus*** L. (Farr et al, 1989; Hepting, 1971). It is apparent that ***K. deusta*** has a very wide host range among woody angiosperms. It has been reported as causing root disease of ***Hevea*** Aubl. and other tropical trees, but in Ceylon (now Sri Lanka) the common causal fungus is ***K. zonata*** (Petch, 1923, 1924). Weir (1927) recognized that ***K. deusta*** and ***K. zonata*** are different taxa; Petch was equivocal on these taxa (see NOTES on ***K. zonata***). Roger (1953) discussed diseases of rubber tree, tea bush, oil palm, cacao, and others caused by ***Ustulina vulgaris*** (***U. deusta***). He followed Van Overeem (1924), as did Petch (1928), in considering ***U. zonata*** to be a form of ***U. vulgaris***. Indeed, his broad concept of ***U. vulgaris*** included ***Kretzschmaria micropus*** (Fr.: Fr.) Sacc. He recognized ***Ustulina*** diseases as serious problems on a variety of woody crop plants throughout the African, American, and Asian tropics.

Kretzschmaria clavus was reported by Ko et al. (1977) to cause root rot of ***Macadamia integrifolia*** Maiden & Betche, the most serious disease of this tree in Hawaii. In Hawaii the fungus apparently moves from stumps and debris of forest trees into macadamia trees in plantations established on former forest land (Ko et al., 1986). Petch (1923) described a similar situation in relation to ***K. zonata*** among several hosts in Ceylon. In any case, ***Kretzschmaria clavus***, ***K. deusta***, ***K. zonata***, and probably other taxa of the genus are undoubtedly pathogens, entering roots and/or butts through dead sprouts, wounds, etc. (Campbell and Davidson, 1940; Ko et al., 1977, 1986; Petch, 1923; Weir, 1927). Because of their capacity to survive on dead material and because they seem to be parasites of opportunity rather than necessity they are considered by us to be facultative parasites. Many more papers dealing with the pathology of ***Kretzschmaria*** (as ***Ustulina***) are briefly summarized and a host index presented by Wilkins (1933).

DEVELOPMENTAL MORPHOLOGY AND CYTOLOGY

The Tulasne brothers recorded and illustrated the general development of ***K. deusta*** (as ***Ustulina vulgaris***) from stromatal initiation through conidial production, ascospore maturation, and senescence (Tulasne and Tulasne, 1863). Miller (1928) likewise did a preliminary study of teleomorph development. Wilkins (1935) did a comprehensive study of the decay caused by ***K. deusta*** (as ***U. vulgaris***) on ***Tilia vulgaris*** Hayne, recording the microscopic effects of the fungus on wood. He concluded that the fungus causes a disease of the standing tree, a white rot of the wood. He did a detailed study of the morphology of ascospore germination and the influence of environmental conditions and proved that germ tubes can penetrate wood (Wilkins, 1938). He later did a detailed study of conidial germination and showed them to be infective propagules that are at least as effective as ascospores (Wilkins, 1939a).

Jong and Rogers (1972) described the anamorph of ***K. deusta*** (as ***Hypoxylon deustum***). They concluded that the sporodochium-like arrangement of conidiophores agrees more with that of ***Xylaria*** than of ***Hypoxylon*** and, further, that ***Ustulina deusta*** is the binomial that most closely indicates the taxonomic position of the fungus.

Rogers (1968) reported the chromosome number of ***K. deusta*** (as ***Hypoxylon deustum***) to be n=4. Ascospores are at first uninucleate, become binucleate via a mitosis, then mature in a uninucleate condition following the disintegration of one of the daughter nuclei. Later studies (unpublished) utilizing fluorescence microscopy showed that the disintegrating nucleus is, in fact, in a cellular appendage that is obliterated during ascospore maturation. This is a common feature among ***Xylaria*** species (Rogers, 1979).

CULTURES AND ANAMORPHS

Cultures of ***K. deusta*** have been described by Jong and Rogers (1972) (as ***Hypoxylon deustum***) and Petrini and Müller (1986) (as ***Ustulina deusta***). They are at first grayish and underlain with black. They soon become radially furrowed and separate from the culture dish. The anamorph is not produced in culture. Van der Gucht (1994) reported a similar type of culture for ***K. deusta***. Her material, in our opinion, represents ***K. pavimentosa*** with the ascospore size range close to the lower limit. Ko et al. (1982) reported a similar type of culture for ***K. clavus***. Cultures of ***K. lucidula*** (Mont.) Dennis, ***K. pavimentosa***, ***K. sandvicensis***, and ***K. zonata*** are likewise of this type, as described later herein; cultures of the latter two species infrequently have produced conidia.

Unfortunately, we have not seen cultures or favorable anamorphic material of ***K. curvirima*** J. D. Rogers & Y.-M. Ju, ***K. macrosperma*** (Mont.) J. D. Rogers & Y.-M. Ju, or ***K. micropus***, taxa that bear spiny remnants of what appear to be old synnemata. ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc. probably has a similar type of anamorph. It would, of course, be highly interesting to know how cultures from these taxa compare with those of previously discussed taxa.

GENERIC AFFINITIES AND EVOLUTION

Kretzschmaria (also as ***Ustulina***) has been considered as closely allied to ***Xylaria***, based upon developmental and cytological studies and the morphology of the anamorph (Jong and Rogers, 1972; Laessøe, 1994; Rogers, 1968; Tulasne and Tulasne, 1863). Interestingly, Miller (1928) concluded that ***Kretzschmaria*** (as ***Ustulina***) developed in a manner consistent with the ***Hypoxylon*** pattern and favored placement of ***U. deusta*** in ***Hypoxylon***. ***Ustulina deusta*** was included in Miller's monograph of ***Hypoxylon*** as ***H. deustum*** (Miller, 1961). Miller's concept of ***Hypoxylon***, however, was much broader than the currently prevalent view (see Ju and Rogers, 1996). Nilsson et al. (1989) showed that seven ***Xylaria*** species caused both Type 1 decay—cavity formation typical of soft rot decay—and Type 2 decay (see earlier), whereas ***K. deusta*** (as ***H. deustum***) caused only Type 2 decay. It thus more closely resembled three ***Daldinia*** Ces. & De Not. species and five ***Hypoxylon*** Bull. species in its decay pattern than ***Xylaria***!

Ustulina has traditionally been separated from ***Kretzschmaria*** based upon the stalked stromata of ***K. clavus***, the type species of the latter genus. Cultures and teleomorphic structures, however, are so similar as to make such a separation unsupportable. ***Kretzschmaria*** is closely related to ***Nemania*** S. F. Gray as emended by Pouzar (1985a, 1985b) and, indeed, a case could be made for putting ***Kretzschmaria*** and ***Ustulina*** into synonymy with it. Nonetheless, ***Kretzschmaria*** is distinctly different from ***Nemania***. The former genus produces conidiophores in dense palisades on immature stromata in nature and is known to produce the anamorph in culture in only a few instances. Cultures on OMA soon become furrowed and loosened from the plate. ***Nemania*** produces more or less loose, scattered conidiophores in nature and on culture plates; cultures are usually smooth and lack furrows.

Kretzschmaria curvirima, ***K. macrosperma***, ***K. micropus***, and probably ***K. cetrarioides*** apparently produce their anamorphs on synnemata rather than over the surface of the immature teleomorph. This indicates a relationship with ***Stilbohypoxylon*** Möller (see Rogers and Ju, 1997). ***Stilbohypoxylon*** itself, however, can be viewed as highly related to ***Xylaria*** or , indeed, a reduced ***Xylaria***. Unfortunately, the above ***Kretzschmaria*** taxa have not been cultured. Future studies should tell whether the taxonomic arrangement used herein is tenable.

The kretzschmarioid and ustulinoid taxa, respectively, are remarkably similar. Indeed, a number of them seem to be members of a series morphologically distinguishable primarily on ascospore size. Future studies of more taxa in culturable condition might provide data that alter our current concepts of species in these fungi.

Kretzschmaria Fr., Summa Veg. Scand. II, p. 409. 1849.
TYPE: ***Sphaeria clavus*** Fr.: Fr. [≡ ***Kretzschmaria clavus*** (Fr.: Fr.) Fr.]
≡ ***Rhopalopsis*** Cooke, Grevillea 11: 93. 1883.
TYPE: ***R. clavus*** (Fr.: Fr.) Cooke [≡ ***Sphaeria clavus*** Fr.: Fr.]
= ***Ascostroma*** Bonord., Handb. Allg. Mykol., p. 272. 1851.

LECTOTYPE [selected by Laessøe (1994)]: ***Sphaeria deusta*** Hoffm.: Fr. [≡ ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin]

= ***Ustulina*** Tul. & C. Tul., Sel. Fung. Carp. II, p. 23. 1863.

TYPE: ***U. vulgaris*** Tul. & C. Tul. [= ***Sphaeria deusta*** Hoffm.: Fr. ≡ ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin]

= ***Holttumia*** C. G. Lloyd, Mycol. Writings 7: 1285. 1924.

TYPE: ***H. congregata*** C. G. Lloyd [= ***Kretzschmaria macrosperma*** (Mont.) J. D. Rogers & Y.-M. Ju]

Stromata clavate, turbinate, obconical, peltate, discoid, restricted-pulvinate, or effused-pulvinate, usually gregarious, discrete, densely aggregated, or fused into crust, bearing umboes or spines on top in certain species, attached to substrate by simple or branched stipes or by narrow connectives, with entire or crenate, thick or thin margins; mature stromata lacking KOH-extractable pigments; surface plane or with inconspicuous perithecial mounds, smooth or with major cracks or scales; carbonaceous tissue forming a thick crust immediately beneath surface; tissue between and beneath perithecia whitish or grayish, coriaceous or woody, usually darkening and disintegrating. Perithecia spherical to obovoid, distributed monostichously only on upper part of stromata. Ostioles higher than stromatal surface and with openings finely papillate, coarsely papillate, or conical. Asci eight-spored, cylindrical, stipitate, fugacious or persistent, with apical ring tubular, amyloid. Ascospores brown, dark brown, or blackish brown, unicellular, ellipsoid or fusoid, inequilateral, with acute, narrowly rounded, or broadly rounded ends, with straight or sigmoid germ slit spore-length to much less than spore-length on less convex side; perispore indehiscent in 10% KOH; epispore smooth.

MORPHOLOGICAL ASSEMBLAGES OF TAXA

KRETZSCHMARIOID TAXA

Stromata stipitate or sessile, with the fertile parts and/or stipes often fused, usually with entire margins; individual fertile parts seldom exceeding 1 cm diam. Anamorphs coremioid or noncoremioid.

Example: ***K. clavus***

USTULINOID TAXA

Stromata more or less sessile, but often attached by rhizoid-like processes or narrow connectives, usually with crenate margins; with fertile parts usually exceeding 1 cm diam. Anamorphs mostly noncoremioid as far as now known.

Example: ***K. deusta***

KEY TO TAXA OF ***KRETZSCHMARIA***

1. Stromata stipitate or sessile, the fertile parts and/or stipes often fused; individual fertile parts seldom exceeding 1 cm diam (kretzschmarioid taxa) 2

1. Stromata more or less sessile, but often attached by rhizoid-like processes or narrow connectives; fertile parts usually exceeding 1 cm diam (ustulinoid taxa) 9
    2. Stromata bearing conical or spine-like processes or umboes on the fertile parts .... 3[*]
    2. Stromata lacking conical or spine-like processes or umboes on the fertile parts 6
3. Ascospores shorter than 40 μm long 4
3. Ascospores longer than 40 μm long 5
    4. Fertile parts often fused into large masses, each containing several perithecia, with stipes flattened, resembling a lichen thallus when viewed from underside; ascospores (25-)26-33 x 8.5-11(-12) μm .... ***K. cetrarioides***
    4. Fertile parts usually not fused into large masses, each containing one or two perithecia, with stipes flattened or obsolete; ascospores 30-40 x 8-12(-13.5) μm .... ***K. micropus***
5. Ascospores (38-)42-52 x (12-)13.5-16 μm, with a conspicuously sigmoid to spiral germ slit .... ***K. curvirima*** *sp. nov.*
5. Ascospores 50-65 x 14.5-17, with straight to slightly sigmoid germ slit .... ***K. guyanensis*** *sp. nov.*
    6. Ascospores 12-15 x 4.5-6 μm .... ***K. zelandica*** *sp. nov.*
    6. Ascospores longer than 20 μm 7
7. Stromata restricted-pulvinate or short cylindrical, sessile, usually with vertical striations on sides; ascospores 27-36 x (6-)7-9.5 μm .... ***K. lucidula***
7. Stromata obconical to turbinate, stipitate or sessile, lacking vertical striations on sides 8
    8. Ostiolar openings finely papillate; ascospores (26-)27-36(-40) x 7-10(-12) μm .... ***K. clavus***
    8. Ostiolar openings conspicuously conical; ascospores 28-37(-40) x (5-)6.5-8 μm .... ***K. neocaledonica*** *comb. nov.*
9. Stromata spherical, depressed-spherical, hemispherical, or applanopulvinate, the surface cracked into distinctive polygonal scales 10
9. Stromata various, the surface usually not cracked into distinctive polygonal scales 11
    10. Ascospores 45-67 x 12.5-17.5(-20) μm .... ***K. macrosperma*** *comb. nov.*[†]
    10. Ascospores 70-95 x 27-45 μm .... ***K. megalospora*** *sp. nov.*
11. Ascospores 50-67.5 x 18-22 μm .... ***K. eriodendri*** *comb. nov.*

---

[*] The umboes borne on the fertile parts of ***K. cetrarioides*** may disintegrate when mature or overmature. This is probably the case for other umbonate taxa.

[†] Unaggregated fertile parts are sometimes much less than 1 cm diameter and appear ***Rosellinia***-like.

11. Ascospores seldom as long and never as broad as above 12
    12. Ascospores mostly shorter than 35 μm 13
    12. Ascospores mostly longer than 35 μm 14
13. Ascospores brown to dark brown, 27-35(–38) x 7-9 μm, with a germ slit much less than spore-length; distribution most northern temperate zones . ... ***K. deusta***
13. Ascospores dark brown to blackish brown, 21-34 x 8.5-12 μm, with a germ slit spore-length or nearly so; distribution mostly subtropical and tropical zones .... ***K. zonata***
    14. Ostioles coarsely papillate to somewhat conical; ascospores 40-50(-54) x 11-15(-16) μm, with a slightly less than spore-length to spore length germ slit .... ***K. milleri sp. nov.***
    14. Ostioles finely papillate to moderately papillate 15
15. Stromata usually with thick, steep margins; ascospores 35–54(-56) x 8.5-11 μm, with a much less than spore-length germ slit .... ***K. pavimentosa***
15. Stromata usually with sloped margins; ascospores (30-)33-46 x 8.5-11.5 μm, with a slightly less than spore-length germ slit .... ***K. sandvicensis***

Kretzschmaria cetrarioides (Welw. & Curr.) Sacc., Syll. Fung. II, p. xxix. 1883. Figs. 3, 17, 18

≡ ***Hypoxylon cetrarioides*** Welw. & Curr., Trans. Linn. Soc. London 26: 282. 1867.
≡ ***Rhopalopsis cetrarioides*** (Welw. & Curr.) Cooke, Grevillea 11: 94. 1883.
= ***Kretzschmaria proxima*** Pat., J. Bot. (Morot) 4: 63. 1890.
= ***Kretzschmaria pechuelii*** Henn., Bot. Jahrb. Syst. 14: 365. 1891.
= ***Kretzschmaria paradoxa*** Pat., Bull. Soc. Mycol. France 8: 51. 1892.
= ***Kretzschmaria lichenoides*** Rick *apud* Rehm, Hedwigia 44: 6. 1904; *non* (Berk. *ex* Cooke) Sacc., 1883; [*nom. rejic.*, ICBN Art. 53.1].
= ***Kretzschmaria botrites*** C. G. Lloyd, Mycol. Writings 6: 995. 1920.
= ***Kretzschmaria singaporensis*** Sacc., Bull. Orto Bot. Regia Univ. Napoli 6: 48. 1921.
= ***Kretzschmaria tonkiniana*** Pat., *ined.*?

Stromata with convex, obconical fertile parts 0.8-4 mm diam, containing several perithecia, usually fused into crust up to 10 cm diam, tapering downwards into radiating, branched, strap-like stipes; surface dull blackish brown, smooth; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia obovoid, 0.8–1.2 mm diam x 1-1.5 mm high. Ostioles conical to conic-papillate. Asci 170-210 μm total length x 10-14 μm broad, the spore-bearing parts 145-170 μm long, the stipes 25-60 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 6-7 μm high x 4.5 μm broad. Ascospores dark brown to blackish brown, unicellular, ellipsoid-inequilateral, with narrowly rounded ends, smooth, (25-)26-33 x 8.5-11(-12) μm, with straight germ slit slightly less than spore-length.

SPECIMENS EXAMINED: ANGOLA: Pechuel-Lösche, wood (HBG, LECTOTYPE [selected here]; GZU-Petrak 2087 [*ex* Lloyd herb.], ISOLECTOTYPE of ***Kretzschmaria pechuelii***). AUSTRALIA: N.

Queensland, Claudie River, 19-25.VII.1978, Lawrence, J. F., wood (JDR). BRAZIL: Rio Grande do Sul, São Leopoldo, XI.1903, Rick, J., Rehm's Ascomyc. 1540, wood (GZU-Petrak 1366; K 52688, SYNTYPES of ***Kretzschmaria lichenoides*** Rick); São Leopoldo, 1906, Rick, J. 172, wood, as ***Kretzschmaria lichenoides*** Rick (GZU-Petrak 1386); Rio Madeira, 30.VIII.1923, Weir, J. R. 6377, wood of ***Hevea***, as ***Kretzschmaria lichenoides*** Rick by Diehl, W. W. (GZU-Petrak 1389); Rick, J., wood, as ***Kretzschmaria lichenoides*** Rick (GZU-Petrak 2084 [*ex* Lloyd herb.]); Rio Negro, Islands near Barcelos, 15.I.1978, Farr, M. L. et al. 119, rotten stump (NY). CUBA: 1905, Murrill, E. A. 69, wood, as ***Kretzschmaria xylarioides*** by Shear, C. L. (GZU-Petrak 1374); Havana Prov., 5.III.1905, Murrill, E. A. 1415, wood, as ***Kretzschmaria xylarioides*** (GZU-Petrak 2181). GABON: Libreville, IV.1979, Gilles, sent by Candoussau, F. as no. 39, wood (JDR). MALAYSIA: Rubber Institute, Fl. Malaya 679 A, B, wood of ***Hevea***, as ***Kretzschmaria cetrarioides*** (K). NIGERIA: 1940, Farquharson, C. O. 63, decaying oil palm, as ***Kretzschmaria paradoxa*** (K). PAPUA NEW GUINEA: Kärnbach, L., wood, as ***Kretzschmaria novoguineensis*** (GZU-Petrak). PERU: Prov. Loreta, Yarinacocha, 24.VI.1958, Lowy, B., wood (JDR). SIERRA LEONE: Njala, 15.III.1947, Deighton, F. C. 2570B, mango branch, as ***Kretzschmaria cetrarioides*** (K). SINGAPORE: Botanic Gardens, IX.1917, Baker, C. F., rotting logs (K, TYPE of ***Kretzschmaria singaporensis***). Economic Gardens, 22.XII.1919, Sappan, wood of ***Hevea*** (K, TYPE of ***Kretzschmaria botrites***). VIETNAM: Tonkin, Bavi, 1887, Balansa 93, wood (FH, HOLOTYPE of ***Kretzschmaria proxima***); Tonkin, Ke So, 10.VII.1892, Bon 9483, wood (FH, HOLOTYPE of ***Kretzschmaria paradoxa***); Tonkin, Ke So, II.1891, Manguier 4993, wood (FH, TYPE of ***Kretzschmaria tonkiniana***).

NOTES: The flattened branching stromatal stipes certainly led Welwitsch and Currey to name this fungus after the lichen genus ***Cetraria*** Ach. and Rick to name it ***K. lichenoides***. The umboes borne on the upper part of stromata indicate that ***K. cetrarioides*** has a synnematous anamorph. Also see NOTES on ***K. micropus***.

Kretzschmaria clavus (Fr.: Fr.) Sacc., Syll. Fung. II, p. xxix. 1883.
Figs. 1, 14

≡ ***Sphaeria clavus*** Fr., Linnaea 5: 543. 1830; Fr.: Fr., Syst. Mycol. Index, p. 162. 1832.

≡ ***Hypoxylon clavus*** (Fr.: Fr.) Mont., Ann. Sci. Nat. Bot., sér. II, 13: 355. 1840.

≡ ***Rhopalopsis clavus*** (Fr.: Fr.) Cooke, Grevillea 11: 94. 1883.

= ***Sphaeria coenopus*** Fr., Linnaea 5: 542. 1830; Fr.: Fr., Syst. Mycol. Index, p. 162. 1832.

  ≡ ***Hypoxylon coenopus*** (Fr.: Fr.) Mont., Ann. Sci. Nat. Bot., sér. II, 13: 356. 1840.

  ≡ ***Xylaria coenopus*** (Fr.: Fr.) Berk. & M. A. Curtis *apud* Berk., J. Acad. Nat. Sci. Philadelphia, ser. II, 2: 285. 1853.

  ≡ ***Rhopalopsis coenopus*** (Fr.: Fr.) Cooke, Grevillea 11: 93. 1883.

≡ ***Kretzschmaria coenopus*** (Fr.: Fr.) Sacc., Syll. Fung. II, p. xxix. 1883.
= ***Xylaria puiggarii*** Speg., Anales Soc. Ci. Argent. 12: 52. 1881.
≡ ***Rhopalopsis puiggarii*** (Speg.) Cooke, Grevillea 11: 94. 1883.
≡ ***Kretzschmaria puiggarii*** (Speg.) Sacc., Syll. Fung. II, p. xxix. 1883.
= ? ***Kretzschmaria novoguineensis*** Henn., Bot. Jahrb. Syst. 15, Beibl. 33: 7. 1892.
= ***Kretzschmaria pusilla*** Ellis & Everhart *apud* C. L. Smith, Bull. Lab. Nat. Hist. Iowa State Univ. 2: 410. 1893.
= ***Kretzschmaria divergens*** Starb., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 27, 3: 6. 1901.
= ***Kretzschmaria australiensis*** Henn., Hedwigia 42 (Beibl.): 83. 1903. *Fide* Dennis (1957).
= ***Kretzschmaria apoda*** C. G. Lloyd, Mycol. Writings 7: 1120. 1922.

Stromata with convex or flattened, turbinate or obconical fertile parts 2-5(-7) mm diam, containing several perithecia, usually fused into small crust, tapering downwards into radiating, cylindrical stipes or infrequently sessile; surface dull copper brown, dull reddish brown to dull blackish brown, smooth or sporadically covered with remnants of papyraceous outermost layer; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia obovoid, 0.5–1 mm diam x 1-1.5 mm high. Ostioles finely papillate. Asci 270-310 μm total length x 9-12 μm broad, the spore-bearing parts 210-230 μm long, the stipes 50-80 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 5-7 μm high x 3.5-4.5 μm broad. Ascospores brown to dark brown, unicellular, ellipsoid or fusoid, inequilateral, with narrowly rounded ends, smooth, (26-)27-36(-40) x 7-10(-12) μm, with straight germ slit much less than spore-length.

Colonies on 2% Difco oatmeal agar at ca. 20°C and under 12 h fluorescent light reaching the edge of 9 cm Petri dish in 3-4 wk, at first white, appressed, azonate, with entire margins, becoming uniformly grayish black due to carbonization beneath colony surface, with strongly radial and lateral folding on surface. Reverse grayish, highly convoluted. Anamorph not produced.

SPECIMENS EXAMINED: BRAZIL: Apiahy, São Paulo, Puiggari, J., wood, *ex* Spegazzini (BPI 716921 [Lloyd herb. 12004], TYPE of ***Kretzschmaria puiggarii***); Itatiaia, 19.X.1969, Dring, D. M. 117, wood, as ***Kretzschmaria clavus*** (K); 15-22.IX.1923, Weir, J. D., wood, as ***Kretzschmaria*** *sp.* by Diehl, W. W. (GZU-Petrak 1382); Matto Grosso, Serra da Chapada, Buriti, 6.IV.1894, Malme, G. O., wood (S, HOLOTYPE; BPI 594483, ISOTYPE of ***Kretzschmaria divergens***); Rio Grande do Sul, I.1922, Rick, J. 20580, wood, as ***Kretzschmaria divergens*** (BPI 594482); Rio Grande do Sul, São Leopoldo, 1906, Rick, J., wood, as ***Kretzschmaria divergens*** (BPI 594484). COLOMBIA: Anglo-Colombian Cacao Collecting Expedition, 6.IX.1952, Baker, R. E. D. 12, ?Cacao, as ***Kretzschmaria clavus*** (K); Intendencia Caqueta, Florencia-Altamira Road, 18.XI.1976, Dumont, K. P. et al., Dumont-CO 3029, wood (JDR); Dpto. Huila, Pital-Popayan Road, 21.I.1976, Dumont, K. P. et al., Dumont-CO 3268, wood (JDR). ECUADOR:

near Rio Sabalo, 13.X.1990, Hodges, C. S., on basal canker of ***Schizolobium parahybum*** (JDR). FRENCH GUIANA: Upper Marouini Region, 2 km N of Oumanfou-Langa Soula, elev. 150 m, 12-14.VIII.1987, Samuels, G. J. et al. 5680 & 5749, wood (JDR; NY); Huhndorf, S. M. 803 (CULTURED), wood (JDR). GRENADA: Grand Etang, 1912-1913, Thaxter, R. 6967, wood (JDR). MAURITIUS: Black River Gorge, 4.II.1975, Lorence, D. DL1099, rotten wood, as ***Kretzschmaria coenopus*** (K). NEW CALEDONIA: Ermitage Stream, Compton, R. H., Fungi of New Caledonia 219, wood, as ***Kretzschmaria coenopus*** (K). NICARAGUA: Castillo Viejo, Rio San Juan, II-III.1893, Smith, C. L., wood (BPI 716923 [Lloyd herb. 11993]; GZU-Petrak 2089 [*ex* Lloyd herb.], TYPES of ***Kretzschmaria pusilla***). PAPUA NEW GUINEA: Kelanoa, Kärnbach, L., wood (HBG, LECTOTYPE [selected here] of ***Kretzschmaria novoguineensis***). PARAGUAY: Guarapi, 1881, Balansa, B., Pl. du Paraguay 2485, wood, as ***Kretzschmaria puiggarii***). PUERTO RICO: El Toro, IV.1974, Rogers, J. D., rotten wood (JDR); Maricao, IV.1974, Rogers, J. D., rotten wood (JDR); El Verde, IV.1974, Rogers, J. D., rotten wood (JDR); 20.X.1920, Earle, F. S. 285, wood, as ***Kretzschmaria*** *sp.* (GZU-Petrak 1352). UGANDA: Maitland, T. D., wood, as ***Kretzschmaria*** *sp.* (GZU-Petrak 1351). U.S.A.: Hawaiian Islands, Hilo, XI.1980, Ko, W. H., relayed by Cook, R. J., ***Macadamia*** (JDR); Hawaiian Islands, Maui, Hana Hwy. #2, 16.I.1996, Rogers, J. D., (CULTURED), wood (JDR); Hawaiian Islands, Molokai, Pala'au Park, 13.I.1996, Rogers, J. D., (CULTURED), wood (JDR). ZAIRE: "Belgian Congo", Vanderyst, H., wood, as ***Kretzschmaria pusilla*** by Lloyd, C. G. (BPI 716924 [Lloyd herb. 12813]).

NOTES: Dennis (1957) separated ***K. coenopus*** from ***K. clavus*** by the fertile parts of the former being "somewhat larger and more flat-topped..., packed tightly together in dense swarms on bark, with shorter, often simple stalks, more numerous perithecia and even less prominent ostiolar papillae." Nonetheless, he mentioned that the separation of these two taxa is not clear cut and intermediate states are not uncommon. Dennis (1961) later synonymized ***K. coenopus*** with ***K. clavus***. Like Dennis (1961), we have not been able to unequivocally separate ***K. coenopus*** from ***K. clavus***, and thus consider them as synonyms at present.

Type material of ***Kretzschmaria novoguineensis*** has certain features of ***K. cetrarioides***: coarsely papillate ostiolar openings and slightly less than spore-length ascospore germ slit. However, its subsessile stromata lead us to place it here.

Kretzschmaria curvirima J. D. Rogers & Y.-M. Ju, *sp. nov.*

Figs. 11, 21-24

Etymology: referring to the spiraling ascospore germ slit

A Kretzschmaria micropodi differt in ascosporis (38-)42-52 x (12-)13.5-16 µm et in rima germinativa sigmoidea vel spirali.

Stromata much as in ***K. micropus***. Perithecia obovoid, 1-1.7 mm diam x 1.5-2 mm high. Ostioles sharply conical. Asci fragmentary, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 13-15 µm high x 8 µm broad. Ascospores dark brown, unicellular, ellipsoid-inequilateral, with narrowly to broadly rounded ends sometimes pinched, smooth, (38-)42-52 x (12-)13.5-16 μm, with sigmoid to spiral germ slit slightly less than spore-length.

SPECIMENS EXAMINED: GUYANA: Cuyuni-Mazaruni Region, Mazaruni Subregion, vic. Chinoweing Village, elev. 650-750 m, 20-23.II.1987, Samuels, G. J. et al. 4642A, wood (NY, HOLOTYPE; WSP, ISOTYPE of ***Kretzschmaria curvirima***). MEXICO: 1895, Smith, C. L., wood, mixed with type material of ***Kretzschmaria spinifera*** (GZU-Petrak 2093 [*ex* Lloyd herb.]; NY).

NOTES: ***Kretzschmaria curvirima*** is the only known ***Kretzschmaria*** species with a sigmoid to spiral ascospore germ slit. Lloyd (1921) commented on ***K. spinifera*** that "The spores are unusually large, 16 x 48." It is very likely that Lloyd's concept of ***K. spinifera*** was based on material of ***K. curvirima***. Also see NOTES on ***K. micropus***.

Kretzschmaria deusta (Hoffm.: Fr.) P. Martin, J. S. African Bot. 36: 80. 1970. Figs. 6, 41, 42

≡ ***Sphaeria deusta*** Hoffm., Veg. Crypt. I, p. 3. 1787; Hoffm.: Fr., Syst. Mycol. II, p. 345. 1823; *non* Wahlenberg, 1812.

≡ ***Discosphaera deusta*** (Hoffm.: Fr.) Dumort., Comment. Bot., p. 91. 1822.

≡ ***Stromatosphaeria deusta*** (Hoffm.: Fr.) Grev., Fl. Edin., p. 355. 1824.

≡ ***Hypoxylon deustum*** (Hoffm.: Fr.) Grev., Scot. Crypt. Fl. VI, Pl. 324, Fig. 2. 1828.

≡ ***Ustulina deusta*** (Hoffm.: Fr.) Lind, Danish Fung., p. 252. 1913.

= ***Sphaeria maxima***, ***convexa***, ***nigerrima*** Haller, Hist. Stirp. Helv. 3: 122. 1768; [*nom. illegit.*, ICBN Art. 23.1 & 23.6]. *Fide* Tulasne and Tulasne (1863).

= ***Sphaeria maxima*** Weber, Spic. Fl. Goett., p. 286. 1778. *Fide* Persoon (1801), Fries (1823).

≡ ***Ustulina maxima*** (Weber) Wettst., Verh. Zool.-Bot. Ges. Wien 35: 592. 1885.

≡ ***Nemania maxima*** (Weber) House, New York State Mus. Bull. 266: 48. 1925; as "(Haller) House"

= ***Sphaeria versipellis*** Tode, Fung. Meckl. Sel. II, p. 55. 1791. *Fide* Persoon (1801), Fries (1823), Tulasne and Tulasne (1863).

= ***Hypoxylon ustulatum*** Bull., Hist. Champ. France I, p. 176. 1791. *Fide* Persoon (1801), Fries (1823), Tulasne and Tulasne (1863).

≡ ***Ustulina vulgaris*** Tul. & C. Tul., Sel. Fung. Carp. II, p. 23. 1863.

= ***Sphaeria albodeusta*** Wahlenb., Fl. Suec., p. 1001. 1826. *Fide* Fries (1832).

= ***Hypoxylon magnosporum*** C. G. Lloyd, Mycol. Writings 6: 1054. 1921.

Stromata pulvinate to effused pulvinate, discrete, densely aggregated or fused, 0.5 to more than 10 cm diam x 0.8-4 mm thick, attached to substrate with narrow connectives, usually with crenate, sloped margins; surface dull copper brown, dark brown to blackish brown, often with reticulate major cracks; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia spherical to obovoid, 0.7–1.5 mm diam x 1-2 mm high. Ostioles papillate to coarsely papillate. Asci 410-480 μm total length x 10-14 μm broad, the spore-bearing parts 170-210 μm long, the stipes 200-260 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 4-6 μm high x 3-4 μm broad. Ascospores brown to dark brown, unicellular, fusoid-inequilateral, with acute ends sometimes pinched, smooth, 27-35(–38) x 7-9 μm, with straight germ slit much less than spore-length.

Cultures and anamorph have been described and illustrated by Jong and Rogers (1972) [as ***Hypoxylon***] and Petrini and Müller (1986) [as ***Hypoxylon***].

SPECIMENS EXAMINED: CZECH REPUBLIC: Mähren (now Moravia), Olspitz bei Mähr.-Weiβkirchen (now Olšovec, probably inside the limits of Hranice na Morave), X.1931, Petrak, F., Mycoth. General. 1886, wood, as ***Ustulina deusta*** by Petrak, F. (WSP 19263). GERMANY: Bavaria, Mittelfranken, Kr. Hersbruck, Hersbruck, Kukensborg, 23.IX.1946, Starcs, K. 2732, wood of ***Fagus sylvatica***, as ***Ustulina vulgaris*** (WSP 15763). U.K.: Scotland, Midlothian, South Queensferry, 16.X.1965, Watling, R. 926, wood of ***Fagus sylvatica***, as ***Ustulina deusta*** (E 00046128); Cooke, M. C., Fungi Britannici Exsiccati, Ed. II, no. 465, wood, as ***Ustulina vulgaris*** (E 00046132); ex herb. Cooke, on wood, as ***Ustulina vulgaris*** (E 00046133); Hants, Lyndhurst, X.1879, Baker, J. G., beech wood, as ***Ustulina vulgaris*** (E 00046129). U.S.A.: Illinois, Jackson Co., Fountain Bluff, 24.X.1984, Rogers, J. D., hardwood stump (JDR); Illinois, Champaign, Brownfield Woods, 12.IX.1982, Bisht, V. S., wood (JDR); Kentucky, Fort Thomas, IV.1912, Weir, J. R. 2716, wood of ***Fagus americana***, as ***Ustulina linearis*** (BPI 587139); Maine, Penobscot Co., W of Orono, 7.X.1975, Stowell, E. A., hardwood stump, as ***Hypoxylon deustum*** (JDR); Michigan, Jackson Co., N of Albion, 8.VIII.1958, Stowell, E. A. X587, rotting oak stump, as ***Hypoxylon deustum*** (JDR); New Hampshire, Thornton, 9.VIII.1967, Rogers, J. D., wood of ***Fagus grandifolia*** (JDR); New Jersey, 31.VII.1920, Sterling, E. B., wood (GZU-Petrak 2023, ISOTYPE of ***Hypoxylon magnosporum***); Ohio, Hamilton Co., Cincinnati, Stanberry Park, 2.X.1956, Cooke, W. B. 30434, wood of ***Fagus grandifolia***, as ***Ustulina vulgaris*** (WSP 45000); Ohio, Hamilton Co., Hamilton County Park, Miami Whitewater Forest, west of New Haven, 24.VI.1974, Goree, H. K. 3451, charred log (JDR); Oregon, Benton Co., Fall Creek Hatchery, 24.VIII.1962, Bonar, L., decaying log of ***Alnus oregona***, as ***Ustulina vulgaris*** (WSP 52865); Pennsylvania, V.1904, Banker, H. J., Ellis & Everhart's Fung. Columb. 1997, rotten oak wood, as ***Ustulina vulgaris*** (WSP 13152); West Virginia, Mason Co., Leon, 24.VIII.1966, Rogers, J. D., wood of ***Acer*** (JDR).

NOTES: ***Kretzschmaria deusta*** is mainly distributed in northern temperate regions. Tropical collections that have been identified as this fungus are mostly ***K. pavimentosa***, ***K. sandvicensis***, or ***K. zonata***. ***Kretzschmaria deusta*** differs from ***K. pavimentosa*** in having smaller ascospores, in having smaller ascal apical rings, and in having thin, sloped stromatal margins; from ***K. sandvicensis*** in having smaller ascospores and in having a much less than spore-length ascospore germ slit; and from ***K. zonata*** in having narrower, paler ascospores and in having a much less than spore-length ascospore germ slit.

Jong and Rogers (1972) and Petrini and Müller (1986) did not find the anamorph of ***K. deusta*** in culture. The anamorph that they described and illustrated was growing on the stromatal surface. The conidial size range was reported as 5-7 x 2.5-3.5 µm in Jong and Rogers (1972) and 4-6 x 2-3 µm in Petrini and Müller (1986). The latter authors assign the anamorph to the form-genus ***Hadrotrichum*** Fuckel. Curiously, Martin (1970) described the ascospores with prominent gelatinous sheaths, a feature not observed by us.

Kretzschmaria eriodendri (Henn.) J. D. Rogers & Y.-M. Ju, *comb. nov.*
Fig. 10

≡ ***Hypoxylon eriodendri*** Henn., Bot. Jahrb. Syst. 22: 78. 1895.

Stromata much as in ***K. pavimentosa***. Perithecia obovoid, 0.8-1 mm diam x 1.5-2 mm high. Ostioles conic-papillate. Asci not observed. Ascospores blackish brown, unicellular, ellipsoid-inequilateral, with broadly or narrowly rounded ends, smooth, 50-67.5 x 18-22 µm, with straight germ slit spore-length or nearly so.

SPECIMEN EXAMINED: CAMEROON: 1891, Jungner, T.R., wood of ***Eriodendron anfractuosum*** (S, LECTOTYPE [selected by Ju and Rogers (1996)] of ***Hypoxylon eriodendri***).

NOTES: Stromata of this fungus and ***K. pavimentosa*** are strikingly similar—with thick, steep margins. They are readily differentiated by their ascospore morphologies.

Kretzschmaria guyanensis J. D. Rogers & Y.-M. Ju, *sp. nov.*
Figs. 4, 25-28

Etymology: after Guyana

A Kretzschmaria micropodi differt in ascosporis 50-65 x 14.5-17 µm et in annulo apicali 15-16 µm alto x 9-10 µm lato.

Stromata restricted-pulvinate to depressed-hemispherical, discrete or densely aggregated, 2-8 mm diam x 2.5-3.5 mm high, bearing one to several umbonate to conical protuberances on top, attached to substrate with narrow connectives; surface dark brown to blackish brown, smooth on top, cracked on sides; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown. Perithecia spherical, 0.8-1.2 mm diam. Ostioles coarsely papillate to conical. Asci 260-310 µm total length x 16-18 µm broad, the spore-bearing parts 230-280 µm long, the stipes 25-35 µm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 15-16 µm high x 9-10 µm broad. Ascospores blackish brown, unicellular, ellipsoid-inequilateral to somewhat allantoid, with narrowly rounded ends sometimes pinched, smooth, 50-65 x 14.5-17, with straight to somewhat sigmoid germ slit slightly less than spore-length or nearly so.

SPECIMEN EXAMINED: GUYANA: Cuyuni-Mazaruni Region, Mazaruni Subregion, Imbaimadai, elev. 450 m, 15.II.1987, Samuels, G. J. et al. 4598, bark (NY, HOLOTYPE; WSP, ISOTYPE of ***Kretzschmaria guyanensis***).

NOTES: This fungus is closely related to ***K. curvirima*** and ***K. micropus***. These taxa are characterized by constantly bearing coremial remnants on the top of stromata. ***Kretzschmaria guyanensis*** differs from the latter two taxa in having larger ascospores and in having larger ascus rings. It also differs from ***K. curvirima*** in having a straight ascospore germ slit.

Kretzschmaria lucidula (Mont.) Dennis, Kew Bull., add. ser., 3: 300. 1970.
Figs. 36, 37

≡ ***Hypoxylon lucidulum*** Mont., Ann. Sci. Nat. Bot., sér. II, 13: 354. 1840.

Stromata restricted-pulvinate or short cylindrical, discrete or densely aggregated, 0.8-6 mm diam x 1–2.5 mm high, attached to substrate with narrow connectives; surface dark brown to blackish brown, smooth or with fine cracks on top, with fine vertical striations on sides; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia spherical, 0.5–0.9 mm diam. Ostioles finely papillate. Asci 230-270 μm total length x 9-12 μm broad, the spore-bearing parts 160-190 μm long, the stipes 60-90 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 5.5-7 μm high x 3-4 μm broad. Ascospores brown to dark brown, unicellular, fusoid or ellipsoid, inequilateral, with narrowly or, less frequently, broadly rounded ends, smooth, 27-36 x (6-)7-9.5 μm, with straight germ slit much less than spore-length.

Cultures much as described for ***K. clavus***. Anamorph not produced.

SPECIMENS EXAMINED: BRAZIL: Rick, J., wood (BPI 716393 [Lloyd herb. 12621], HOLOTYPE of ***Kretzschmaria apoda***). FRENCH GUIANA: Paul Isnard Area, ca. 150 km S of St. Laurent du Moroni, Citron, Mt. Decou Decou, 11,12.III.1986, Samuels, G. J. & Searwar, P. 4248, wood (JDR; NY); Montagne de Kaw, Route de l'est, 21.III.1986, Samuels, G. J. & Feuillet, C. 4405, bark (JDR; NY); Upper Marouini Region, 2 km N of Oumanfou-Langa Soula, elev. 150 m, 12-14.VIII.1987, Samuels, G. J. et al. 5743, wood (JDR; NY); 1994, Huhndorf, S. M. 677, bark (JDR). GUYANA: 11.1837, Leprieur, C. 430, wood (K, ISOTYPE of ***Hypoxylon lucidulum***); Samuels, G. J. 3846.

NOTES: This fungus has features that are intermediate between the kretzschmarioid and ustulinoid fungi. The stromata are more or less sessile as in most of the ustulinoid taxa but remain restricted, never exceeding 1 cm diam. The ascospore morphology in general resembles that of ***K. clavus***.

Kretzschmaria macrosperma (Mont.) J. D. Rogers & Y.-M. Ju, *comb. nov.*
Figs. 32-35

≡ ***Hypoxylon macrospermum*** Mont., Ann. Sci. Nat. Bot., sér. II, 13: 351. 1840.

≡ ***Ustulina macrosperma*** (Mont.) Sacc., Syll. Fung. I, p. 351. 1882.

= ***Hypoxylon fragaria*** Ces., Atti Accad. Sci. Fis. 8: 18. 1879.

= ? ***Hypoxylon gigaspermum*** Henn. & E. Nyman *apud* Warb., Monsunia 1: 168. 1899.

= ***Hypoxylon nucigenum*** Henn., Hedwigia 47: 259. 1908.

= ***Hypoxylon nucele*** C. G. Lloyd, Mycol. Writings 7: 1180. 1923.

= ***Holttumia congregata*** C. G. Lloyd, Mycol. Writings 7: 1285. 1924.

Stromata spherical, depressed-spherical, hemispherical, or applanopulvinate, discrete or densely aggregated, 0.4-5 cm diam x 0.5–3 cm high, attached to substrate with narrow connectives or short stipes; surface dull ochraceous brown, dark brown to blackish brown, cracked into distinctive polygonal scales; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia spherical to obovoid, 2.5-4(-5) mm diam x 2.5-5.5 mm high. Ostioles obtusely conical. Asci fragmentary, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 9-12 µm high x 6-8 µm broad. Ascospores blackish brown, unicellular, ellipsoid-inequilateral, with broadly or, infrequently, narrowly rounded ends, smooth, 45-67 x 12.5-17.5(-20) µm, with straight germ slit spore-length or nearly so.

SPECIMENS EXAMINED: CHINA: Hainan, Ling-shui, 17.IX.1934, Deng, S. Q. 4741, wood, as ***Hypoxylon nucele*** (GZU-Petrak 1326 [*ex* Lloyd herb.]); Hainan, Ting-an, 5.I.1935, Deng, S. Q. 8310, wood, as ***Hypoxylon nucele*** (GZU-Petrak 1189 [*ex* Lloyd herb.]). GUYANA: Upper Demerara-Berbice Region, Upper Demerara Subregion, Mabura Hill, elev. ca. 50 m, 27.III.1987, Samuels, G. J. 5260, wood (NY, NEOTYPE [selected here]; WSP, ISONEOTYPE of ***Hypoxylon macrospermum***); Upper Demerara-Berbice Region, Upper Demerara Subregion, Mabura Hill, elev. ca. 100 m, 26.III.1987, Samuels, G. J. 5192, wood (JDR; NY). MALAYSIA: Borneo, Sarawak, Beccari, O. 65, 199, 200, & 215, wood (RO, SYNTYPES of ***H. fragaria***); Borneo, Beccari, O., wood (BPI 11243, 11477, & 11235, TYPES of ***H. fragaria***); Malay, State of Pehang, Fraser Hill, IX.1922, Holttum, R. E., dead stump (BPI 715995 [Lloyd herb. 7259], HOLOTYPE of ***Holttumia congregata***); Malay Peninsula, 14.IX.1923, Holttum, R. E., wood, as ***Hypoxylon nucele*** (GZU-Petrak 2038 [*ex* Lloyd herb.]). PHILIPPINES: Island of Palawan, E-wi-ig River, II.1903, Merrill, E. D. 3583, prostrate log (BPI 590963, ISOSYNTYPE of ***Hypoxylon nucigenum***); Luzon, Mt. Makiling, 23.IX.1920, Reinking, O. A. 9562, wood (BPI [Lloyd herb. 11594], HOLOTYPE; GZU-Petrak 1188, ISOTYPE of ***Hypoxylon nucele***); Luzon, Mt. Makiling, 23.IX.1920, Reinking, O. A., wood, as ***Hypoxylon nucele*** (GZU-Petrak 2037 [*ex* Lloyd herb.]).

NOTES: The ascospore morphology resembles that of ***K. guyanensis***. We were unable to locate the type of ***Hypoxylon macrospermum*** which is a Leprieur collection from Guyana. We thus select a neotype for it. Neither could we locate the type material of ***H. gigaspermum*** from Java, Indonesia. Hennings' description (in Saccardo, 1902) leaves little doubt that ***H. gigaspermum*** is a synonym of ***K. macrosperma***.

Miller (1961) recognized ***H. fragaria*** and ***H. nucigenum*** as distinct species but suspected that "they could be combined if more specimens were available for study." Specimens referred to these taxa often feature unaggregated stromata bearing one or few perithecia. One collection [MEXICO: Tamaulipas State, Gómez Farías Municipality, Malacate, 31.III.1988, Baldazo 216, wood (ITCV; JDR)] shows abundant coremia associated with the stromata. ***Kretzschmaria macrosperma*** appears to have affinities with ***Stilbohypoxylon*** and, indeed, could probably be accommodated in that genus.

Kretzschmaria megalospora J. D. Rogers & Y.-M. Ju, *sp. nov.*
Figs. 5, 29-31

Etymology: referring to the gigantic ascospores

A Kretzschmaria macrosperma differt in ascosporis 70-95 x 27-45 μm et in annulo apicali 10-12 μm alto x 11-13 μm lato.

Stromata much as in ***K. macrosperma***. Perithecia spherical to obovoid, 1.2-2.5 mm diam x 2-3 mm high. Ostioles obtusely conical. Asci fragmentary, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 10-12 μm high x 11-13 μm broad. Ascospores black, unicellular, ellipsoid-inequilateral, with broadly or narrowly rounded ends, smooth, 70-95 x 27-45 μm, with straight germ slit spore-length or nearly so.

SPECIMENS EXAMINED: MALAYSIA: Malay Peninsula, 14.IX.1923, Holttum, R. E., wood, mixed with ***Kretzschmaria macrosperma***, as ***Hypoxylon nucele*** (GZU-Petrak 2038 [*ex* Lloyd herb.], HOLOTYPE; WSP, ISOTYPE of ***Kretzschmaria megalospora***); Borneo, Sarawak, Beccari, O. 215, wood, mixed with ***Kretzschmaria macrosperma***, as ***Hypoxylon fragaria*** (RO).

NOTES: This fungus is very similar to ***K. macrosperma*** from which it differs in having much larger ascospores and ascal apical rings. It is noteworthy that the two collections of ***K. megalospora*** that we have examined were mixed with ***K. macrosperma***. Future collections might show that a single taxon with an extremely wide ascospore size range is involved.

Kretzschmaria micropus (Fr.: Fr.) Sacc., Syll. Fung. II, p. xxix. 1883.
Figs. 19, 20

≡ ***Sphaeria micropus*** Fr., Linnaea 5: 542. 1830; Fr.: Fr., Syst. Mycol. Index, p. 169. 1832.

≡ ***Hypoxylon micropus*** (Fr.: Fr.) Berk., J. Linn. Soc., Bot. 10: 383. 1869.

≡ ***Rhopalopsis micropus*** (Fr.: Fr.) Cooke, Grevillea 11: 94. 1883.

= ***Hypoxylon aggregatum*** Welw. & Curr., Trans. Linn. Soc. London 26: 282. 1867.

≡ ***Rhopalopsis aggregatum*** (Welw. & Curr.) Cooke, Grevillea 11: 93. 1883.

≡ ***Kretzschmaria aggregata*** (Welw. & Curr.) Sacc., Syll. Fung. II, p. xxix. 1883.

= ***Kretzschmaria spinifera*** Ellis & Macbride *apud* Ellis & Everh., Bull. Lab. Nat. Hist. Iowa State Univ. 4: 71. 1896.

= ***Hypoxylon abyssinicum*** Sacc., Ann. Mycol. 10: 312. 1912.

= ***Kretzschmaria erythraeae*** Baccarini & Sacc. *apud* Baccarini, Ann. Botanica 14: 133. 1916. *Fide* Dennis (1957).

Stromata with convex, obconical fertile parts 1-2.5 mm diam, usually containing one or two perithecia, densely aggregated or fused into composite structure, bearing one to several spines on top, tapering downwards into narrow connectives or radiating, strap-like stipes; surface dull blackish brown, usually with slight reticulate cracks; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia spherical to obovate, 0.7-1.8 mm diam x 1.2-2 mm high. Ostioles sharply conical. Asci fragmentary, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 7-8 µm high x 5 µm broad. Ascospores dark brown, unicellular, ellipsoid-inequilateral, with narrowly to broadly rounded ends, smooth, 30-40 x 8-12(-13.5) µm, with straight germ slit slightly less than spore-length.

SPECIMENS EXAMINED: ANGOLA: Welwitsch, wood (K, TYPE of ***Hypoxylon aggregatum***). BRAZIL: Rick, J., wood, as ***Kretzschmaria lichenoides*** (GZU-Petrak 2084). ETHIOPIA (ABYSSINIA): 4.1904, Pappi, A., corticated wood (PAD, HOLOTYPE of ***Hypoxylon abyssinicum***). MEXICO: 1895, Smith, C. L., wood (NY, LECTOTYPE [selected here]; GZU-Petrak 2093; K, ISOLECTOTYPES of ***Kretzschmaria spinifera***). PUERTO RICO: 12.XII.1915, Fink, B. 817, wood, as ***Kretzschmaria spinifera*** (GZU-Petrak 1373). SRI LANKA: Peradeniya, "sent before Dec., 1868", Thwaites, G. H. K. 60, wood, as ***Sphaeria micropus*** (K). U.S.A.: Florida, Brooksville, 19.II.1924, Stevenson, J. A. 2083, wood, as ***Kretzschmaria spinifera*** by Diehl, W. W. (GZU-Petrak 1372).

NOTES: Ascospore morphology is much like that of ***K. cetrarioides***. Dennis (1957) considered ***Kretzschmaria spinifera*** to be a synonym of ***K. micropus***. ***Kretzschmaria spinifera*** was described with compressed ascospores, 25-35 x 10-12 x 6-8 µm (Ellis and Everhart, 1896). The type at NY, however, is composed of two different elements. They have similar gross morphologies, but differ in ascospore size ranges and orientations of germ slits. The element with smaller ascospores and a straight ascospore germ slit fits well the protologue of ***K. spinifera***. We thus agree with Dennis (1957) in treating ***K. spinifera*** as a synonym of ***K. micropus***, and select the part of the original material as lectotype. The element with larger ascospores and a sigmoid to spiral germ slit is described elsewhere herein as new (see ***K. curvirima***).

Hypoxylon cyclopicum Speg. [BRAZIL: Apiahy, Puiggari 2374, microscope slide of C. L. Shear (BPI-CLS, TYPE); São Paulo, 5.IV.1947, Fogg, H., wood, as ***Kretzschmaria spinifera*** (GZU-Petrak). GABON: N of Libreville, Forêt La Monclah, VI.1979, Gilles 88, sent by Candoussau, F., wood (JDR). GRENADA: 1912-1913, Thaxter, R., wood (JDR). TRINIDAD: Port of Spain, Emperor Valley, 1912-1913, Thaxter, R. 6936, wood, as ***Hypoxylon cyclopicum*** by Miller, J. H. (JDR, *ex* FH). U.S.A.: Hawaiian Islands, Hawaii, 14.II.1992, Ko, W 273F, wood of ***Macadamia*** (JDR).] appears to be closely related to, if not conspecific with, ***K. micropus***. They share most of the characteristics except that ***H. cyclopicum*** has larger perithecia, 2-3.5 mm diam, and are usually sessile. It is probable that ***H. cyclopicum*** and ***K. micropus*** represent variants of the same species.

Petch (1924) gives a good account of the gross aspects of development. He discusses the ***Stilbum***-like conidial state and remarks that it is doubtfully distinct from ***K. cetrarioides***. We consider ***K. micropus*** to be distinct from ***K. cetrarioides***. The coremial anamorphs indicate their affinities with ***Stilbohypoxylon*** and, indeed, they could probably be accommodated in that genus.

Kretzschmaria milleri J. D. Rogers & Y.-M. Ju, *sp. nov.*

Figs. 43-45

Etymology: after the American mycologist, Julian H. Miller

A Kretzschmaria deusta differt in ascosporis 40-50(-54) x 11-15(-16) μm, in rima germinativa longa, et in annulo apicali 11-16 μm alto x 7-8.5 μm lato.

Stromata much as in ***K. deusta***. Perithecia obovoid to tubular, 0.5–1.5(-2) mm diam x 1.5-3.5 mm high. Ostioles coarsely papillate to somewhat conical. Asci fragmentary, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 11-16 μm high x 7-8.5 μm broad. Ascospores dark brown to blackish brown, unicellular, fusoid to ellipsoid, inequilateral, with narrowly rounded ends, smooth, 40-50(-54) x 11-15(-16) μm, with straight germ slit slightly less than spore-length to spore-length.

SPECIMENS EXAMINED: FRENCH GUIANA: Saül, Mt. Boeuf Mort, elev. 200-250 m, 14.II.1986, Samuels, G. J. 3740, log (JDR; NY); Paul Isnard Area, ca. 150 km S of St. Laurent du Moroni, Citron, Mt. Lucifer, 7-14.III.1986, Samuels, G. J. & Searwar, P. 4187, recently dead tree (JDR; NY). GUYANA: Upper Demerara-Berbice Region, Upper Demerara Subregion, Mabura Hill, elev. ca. 50 m, 27.III.1987, Samuels, G. J. 5259, wood (NY, HOLOTYPE; WSP, ISOTYPE of ***Kretzschmaria milleri***); GS 6531. MEXICO: Chiapas State, Ocosingo Municipality, Montes Azules Biosphere Reserve, 29.V.1988, San Martín, F. 838, wood (ITCV; JDR). VENEZUELA: Edo. Merida, above Lagunillas, La Trampa, Loma El Burro, elev. 2100 m, 12.XII.1990, Samuels, G. J. et al. 7006, log (BPI; JDR).

NOTES: ***Kretzschmaria milleri*** is equivalent to Miller's interpretation of ***Hypoxylon pavimentosum*** and is characterized with coarsely papillate ostiolar openings (Miller, 1961). It differs from ***K. deusta*** mainly in having larger ascal apical rings, in having larger ascospores, and in having a longer ascospore germ slit; and differs from ***K. pavimentosa***, as we interpret it herein, in usually having stromata with sloped margins, in having coarsely papillate ostiolar openings, in having larger ascal apical rings, and in having a nearly spore-length ascospore germ slit. The ascospore morphology of ***K. milleri*** in general agrees with that of ***K. sandvicensis*** from which the former species differs primarily in having coarsely papillate ostiolar openings and in having larger ascal apical rings.

A collection from Guyana [Cuyuni-Mazaruni Region, Mazaruni Subregion, along Koatse R., 3.III.1987, Samuels, G. J. et al. 4795, wood (JDR; NY)] probably belongs here but has larger ascospores, 50-58 x 13-17.5 μm, and larger ascal apical rings, 15-17 μm high x 8-12 μm broad, than the above-cited specimens. It probably represents a large-spored variant of ***K. milleri***.

Kretzschmaria neocaledonica (Har. & Pat.) J. D. Rogers & Y.-M. Ju, *comb. nov.*

Figs. 46, 47

≡ ***Hypoxylon neocaledonicum*** Har. & Pat., J. Bot. (Morot) 17: 14. 1903.

= ***Hypoxylon sphaericum*** Pat., Bull. Soc. Mycol. France 40: 35. 1924.

Stromata obconical to turbinate, discrete to densely aggregated, 4-10 mm diam x 4-8 mm high, attached to substrate with short stipe or narrow connective; surface dark brown to black, smooth on top and reticulately cracked on sides; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white, becoming dark brown and disintegrating. Perithecia obovoid to tubular, 0.7-1.2 mm diam x 1.7-2.5 mm high. Ostioles conspicuously conical. Asci fragmentary, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 4.5-5.5 μm high x 3-3.5 μm broad. Ascospores brown to dark brown, unicellular, fusoid-inequilateral, with narrowly rounded ends frequently pinched, smooth, 28-37(-40) x (5-)6.5-8 μm, with straight germ slit much less than spore-length.

SPECIMENS EXAMINED: NEW CALEDONIA: Carrela, Coinde, Bernier, wood (FH, HOLOTYPE of ***Hypoxylon neocaledonicum***); 1907, Le Rat, wood, as ***Phylacia neocaledonica*** Pat. & Har., *ined.* (FH [2 pks.]). TAIWAN: Nan-tou Co., Lu-ku, Shi-tou, 27.VII.1984, Ju, Y.-M. 73072702, dead wood (JDR). VIETNAM: Tonkin, Nam-Kep, VII.1922, Petelot, M. 551, wood (FH, HOLOTYPE of ***Hypoxylon sphaericum***).

NOTES: ***Kretzschmaria neocaledonica*** resembles ***K. clavus*** but differs mainly in having conspicuous conical ostiolar openings. The ascospore morphology resembles that of ***K. clavus***.

Kretzschmaria pavimentosa (Ces.) P. Martin, J. S. African Bot. 42: 74. 1976.

Figs. 9, 38-40

≡ ***Hypoxylon pavimentosum*** Ces., Atti Accad. Sci. Fis. 8: 18. 1879.
≡ ***Ustulina pavimentosa*** (Ces.) Cooke, Grevillea 12: 3. 1883.
= ? ***Ustulina brasiliensis*** Speg., Anales Soc. Ci. Argent. 12: 110. 1881.
= ***Kretzschmaria bulgarioides*** Rehm, Hedwigia 40: 143. 1901.

Stromata discoid, restricted-pulvinate, or effused pulvinate, discrete or densely aggregated, 0.3–7 cm diam x 1–4 mm thick, attached to substrate with narrow connectives, usually with crenate, thick, steep margins; surface copper brown, dark brown to blackish brown, smooth or with major cracks; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, white to gray, becoming dark brown and disintegrating. Perithecia obovoid to tubular, 0.5–1.2 mm diam x 0.8-2 mm high. Ostioles papillate. Asci 290-370 μm total length x 11-15 μm broad, the spore-bearing parts 200-240 μm long, the stipes 80-150 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 6-9 μm high x 4.5-6 μm broad. Ascospores dark brown to blackish brown, unicellular, fusoid-inequilateral, with acute ends sometimes pinched, smooth, 35–54(-56) x 7.5-11 μm, sometimes laterally compressed, with narrow sides 6.5-8 μm and broad sides 11-14 μm, with straight germ slit much less than spore-length.

Cultures much as described for ***K. clavus***. Anamorph not produced.

SPECIMENS EXAMINED: BRAZIL: Ule, H. E., wood (S (2 pks.), HOLOTYPE of ***Kretzschmaria bulgarioides***). ECUADOR: near Rio Sabalo, 13.X.1990, Hodges, C. S., on basal canker of ***Schizolobium parahybum*** (JDR). FRENCH GUIANA: Piste de Saint-Elie, km 16 on road between Sinnamary and St. Elie, "ECEREX", ORSTOM research area, II-III.1986, Samuels, G. J. 4037, bark (JDR; NY); Paul Isnard Area, ca. 150 km S of St. Laurent du Moroni, Citron, Mt. Decou Decou, 11, 12. III.1986, Samuels, G. J. & Searwar, P. 4237 & 4246, bark of liana (JDR; NY); vic. of Cayenne, 23.III.1986, Samuels, G. J. & Feuillet, C. 4458, wood (JDR; NY). GUYANA: Cuyuni-Mazaruni Region, Mazaruni Subregion, vic. Chinoweing Village, 20-23.II.1987, Samuels, G. J. et al. 4672 & 4744, wood (JDR; NY); Cuyuni-Mazaruni Region, Mazaruni Subregion, along Koatse R., 3.III.1987, Samuels, G. J. et al. 4901, wood (JDR; NY); Upper Demerara-Berbice Region, Upper Demerara Subregion, Mabura Hill, 26-27.III.1987, Samuels, G. J. 5208 & 5255, wood (JDR; NY). GRENADA: Grand Etang, 1912-1913, Thaxter, R. 7721, bark, as ***Hypoxylon deustum*** by Miller, J. H. (JDR [*ex* FH]). HONDURAS: Zamorano, VI.1977, Rogers, J. D. & Grove, rotten wood (JDR). MALAYSIA: Borneo, Sarawak, Beccari, O. 206, wood (K 52691, LECTOTYPE [selected here]; BPI 738764 [*ex* Berk. herb., spores not found], ISOLECTOTYPE of ***Hypoxylon pavimentosum***). MEXICO: Chiapas State, Jaltenango Municipality, Santa Rita-El Triunfo hike road, 7.VI.1988, San Martín, F. 667, wood (ITCV; JDR); Chiapas State, Ocosingo Municipality, Ejido Boca de Chajul, 29.V.1988, San Martín, F. 824, monocot wood (ITCV; JDR). NEW ZEALAND: Auckland, Waitakere Ra., Kauri Grove Tr., 27.XI.1980, Samuels, G. J. et al. 80-164, wood (PDD 49699). PUERTO RICO: El Toro, IV.1974, Rogers, J. D., rotten wood (JDR); Mayagüez, Las Marias Road, Earle, F. S. 246, rotten stump, as ***Ustulina zonata*** by Diehl, W. W. (BPI 587146). TAIWAN: I-lan Co., Ta-tung, Chi-lan-shan, 14.IX.1991, Ju, Y.-M. 80091412, wood (JDR); Nan-tou Co., Yu-chee, Lien-hwa-chee, 16.X.1997, Wang, Y.-Z. 511 (CULTURED), wood (JDR). U.S.A.: Hawaiian Islands, Hawaii, Wiapio Trail, 6.I.1996, Rogers, J. D., wood of ***Alnus nepalensis*** (JDR); Hawaiian Islands, Hilo, XI.1980, Ko, W. H., relayed by Cook, R. J., ***Macadamia*** (JDR).

NOTES: This fungus is one of the most frequently encountered ***Kretzschmaria*** species in the tropics and subtropics. Stromata of ***K. pavimentosa*** usually have thick, steep margins. ***Kretzschmaria sandvicensis*** has a similar ascospore size range but differs in having sloped margins, in having ascospores with a nearly spore-length germ slit and obtuse ends. Also compare with ***K. eriodendri***. It is noteworthy that the ascospore size range from the type of ***Hypoxylon pavimentosum*** is 44-54 x 10-11 μm, close to the upper limit of the species, whereas that from the type of ***K. bulgarioides*** is 36-42 x 7.5-9 μm, close to the lower limit of the species. However, other specimens that we have examined have ascospore size ranges bridging the gap and forming a continuum over a wide range.

We were unable to locate Cesati's original material at RO. We thus lectotypify the part of type material at K. The illustrations of ***Hypoxylon pavimentosum*** provided by Miller (1961) are based on a T. D. Maitland collection from Uganda which has coarsely papillate ostiolar openings. We consider this fungus a distinct species and describe it as new herein (see ***K. milleri***). We have not examined the type of ***K. brasiliensis***. The description of Spegazzini (1881) seems to correspond with our concept of ***K. pavimentosa***.

Three specimens [BRAZIL: Pará, Municipio Oriximiná, Rio Trombetas, 14 km N on Cachoeira Porteira Rd., 19.VI.1980, Dunn, P., 80PHD-16, wood (JDR; NY). GUYANA: Cuyuni-Mazaruni Region, Mazaruni Subregion, along Koatse R., 3.III.1987, Samuels, G. J. et al. 4927, wood (JDR; NY). FRENCH

GUIANA: Upper Marouini R, between Roche Koutou and an unnamed granitic 350 m high inselberg, elev. 200-300 m, 19-20.VIII.1987, Samuels, G. J. et al. 5920, bark (JDR; NY).] are similar to ***K. pavimentosa*** but differ in having a reticulate network of cracks on the stromatal surface and in having a nearly spore-length ascospore germ slit. They might represent a new taxon. San Martín and Rogers (1993) documented ***Kretzschmaria cf. bulgarioides*** from Mexico. The general morphology of that fungus agrees with ***K. pavimentosa*** except for having smaller ascospores and stipitate stromata. It likewise might represent a new taxon.

Kretzschmaria sandvicensis (Reichardt) J. D. Rogers & Y.-M. Ju, *comb. nov.* Fig. 8

≡ ***Hypoxylon sandvicense*** Reichardt, Sitzungsber. Kaiserl. Akac. Wiss., Math.-Naturwiss. Cl., Abt. I, 75: 6. 1877.
= ***Ustulina tessulata*** Berk. *ex* Cooke, Grevillea 12: 3. 1883.
= ***Nummularia macrospora*** Pat., Bull. Soc. Mycol. France 3: 175. 1887.
= ***Nummularia gigaspora*** Pat., *ined.*

Stromata and perithecia much as in ***K. deusta***. Ostioles finely papillate to papillate. Asci 290-340 μm total length x 11-15 μm broad, the spore-bearing parts 200-240 μm long, the stipes 70-110 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 6-10 μm high x 3.5-5.5 μm broad. Ascospores dark brown, unicellular, fusoid to ellipsoid, inequilateral, with narrowly to broadly rounded ends, smooth, (30-)33-46 x 8.5-11.5 μm, with straight germ slit nearly spore-length or slightly less than spore-length.

Cultures much as described for ***K. clavus***. Anamorph sometimes produced in culture. Sporulating regions scattered over entire surface of colony, forming olivaceous gray pustules. Conidiophores arranged in dense, upright palisades, dichotomously branched several times from base, yellowish or brownish, smooth. Conidiogenous cells cylindrical, hyaline, smooth, 20-40 x 3-4.5 μm, bearing slightly raised poroid lateral and terminal conidial secession scars. Conidia produced holoblastically in sympodial sequence. Conidia hyaline, smooth, ellipsoid to short cylindrical, 7.5-9.5 x 2.5-3.5 μm, with flattened base indicating former point of attachment to conidiogenous cell.

SPECIMENS EXAMINED: COLOMBIA: near Tumaco, XII.1940, Skutch & Stryker, Stakman 245, wood, as ***Ustulina zonata*** by Diehl, W. W. (BPI 587044). FRENCH GUIANA: Piste de Saint-Elie, km 16 on road between Sinnamary and St. Elie, “ECEREX”, ORSTOM research area, II-III.1986, Samuels, G. J. 3861, bark (JDR; NY); 1994, Huhndorf, S. M. 941, wood (JDR). GUYANA: GS 3533; Cuyuni-Mazaruni Region, Mazaruni Subregion, vic. Chinoweing Village, elev. ca. 650-750 m, 20-23.II.1987, Samuels, G. J. et al. 4670, wood (JDR; NY); East Berbice-Corentyne Region, Canje R., from Ekwarun Creek to Three Sisters, 9-11.IV.1987, Samuels, G. J. et al. 5356, bark (JDR; NY). INDIA: Bombay, 1882, Carter, H. J., wood, as ***Hypoxylon tessulatum*** Berk., *ined.* (K 52689, HOLOTYPE of ***Ustulina tessulata***). JAVA: Tjibodas, 1907-1908, Höhnel, F., Weese's Eumycetes Selecti Exs. 431, rotten wood, as ***Ustulina zonata*** (BPI 587148). MEXICO: Chiapas State, Ocosingo Municipality, Ejido Boca de Chajul, 27.V.1988, San Martín,

F. 773, wood (ITCV; JDR); Oaxaca State, Temazcal Town, 8.X.1988, San Martín, F. 1112, wood (ITCV; JDR); Tamaulipas State, Gómez Farías Municipality, El Cielo Biosphere Reserve, 22.VII.1988, Santiago Chacón 371, wood (ITCV; JDR). NEW CALEDONIA: no. 735, wood (FH [3 pks.], HOLOTYPE of ***Nummularia macrospora***); Mont Mou, VII.1909, Le Rat 229, wood, as ***Nummularia macrospora*** Pat. (FH); wood, as ***Nummularia gigaspora*** Pat., *ined.* (FH). PAPUA NEW GUINEA: Madang Province, Balek Wildlife Sanctuary, 3.XI.1995, Aptroot, A. 36795, tree trunks (CBS; JDR). PHILIPPINES: Luzon, Prov. of Rizal, I.1906, Foxworthy, F. W. 56, wood, as ***Ustulina maxima*** (BPI 587140 & 587141); Luzon, Los Baños, 1917, Elmer, A. D. E. 18371, wood (JDR). PUERTO RICO: El Verde, IV.1974, Rogers, J. D., rotten wood (JDR). U.S.A.: Hawaii, Wailuku, 1868-71, Wawra 1831 & 1832, corticated wood (W, SYNTYPES of ***Hypoxylon sandvicense***); Hawaiian Islands, Hawaii, Hilo Zoo, 4.I.1996, Rogers, J. D., (CULTURED), wood (JDR).

NOTES: This fungus is commonly encountered in the tropics and subtropics and has frequently been identified as ***K. deusta*** or one of its synonyms. They differ in the former having more conspicuous ostiolar openings, larger ascospores with more or less obtuse ends, larger ascal apical rings, a longer ascospore germ slit, and longer conidia. ***Kretzschmaria milleri*** differs from the present fungus in having coarsely papillate ostiolar openings, larger ascal apical rings, and ascospores that average larger.

Kretzschmaria zelandica J. D. Rogers & Y.-M. Ju, *sp. nov.*

Figs. 2, 15, 16

Etymology: after New Zealand

A speciebus Kretzschmariae omnibus alteris differt in ascosporis brevibus, 12-15 x 4.5-6 μm, et in carne stromatis atri.

Stromata with convex or flattened, turbinate or obconical fertile parts 2-5(-7) mm diam, containing several perithecia, usually fused into crust, tapering downwards into radiating, rounded stipes; surface dull blackish brown, finely cracked; carbonaceous immediately beneath surface; tissue between and beneath perithecia coriaceous to woody, black, disintegrating. Perithecia spherical, 0.4-0.5 mm diam. Ostioles finely papillate. Asci 210-230 μm total length x 6-7 μm broad, the spore-bearing parts 75-90 μm long, the stipes 130-150 μm long, with apical ring bluing in Melzer's iodine reagent, urn-shaped, 2 μm high x 2 μm broad. Ascospores brown to dark brown, unicellular, fusoid to ellipsoid, inequilateral, with narrowly rounded ends frequently pinched, smooth, 12-15 x 4.5-6 μm, with straight germ slit much less than spore-length.

SPECIMENS EXAMINED: NEW ZEALAND: Westland, Jackson Bay, Smooth Stream Track, 21.III.1991, Johnston, P. R., decorticated wood (PDD 58447, HOLOTYPE; WSP, ISOTYPE of ***Kretzschmaria zelandica***); Wellington, Weraroa, IX.1919, Cunningham, G. H., dead wood, as ***Kretzschmaria mauritanica*** by Lloyd, C. G. (PDD 106); Northland, Hokianga Co., Waipoua State Forest, 20.I.1955, Dingley, J. M., wood of ***Dacrydium***

cupressinum, as ***Xylaria tuberiformis*** by Dingley, J. M., as ***Kretzschmaria*** *sp.* by Samuels, G. J. (PDD 30889).

NOTES: ***Kretzschmaria zelandica*** has the smallest ascospore size range in the genus. It is peculiar in having a black stromatal interior.

Kretzschmaria zonata (Lév.) P. Martin, J. S. African Bot. 42: 75. 1976.
Figs. 7, 48

≡ ***Sphaeria zonata*** Lév., Ann. Sci. Nat. Bot., sér. III, 3: 48. 1845.

≡ ***Ustulina zonata*** (Lév.) Sacc., Syll. Fung. I, p. 352. 1882.

= ? ***Ustulina vulgaris*** Tul. & C. Tul. *f.* ***madagascariensis*** Henn. *apud* Voeltzkow, Reise in Ost-Afrika 1903-1905, III, Heft 1, p. 30. 1908.

≡ ***Hypoxylon deustum*** (Hoffm.: Fr.) Grev. *f.* ***madagascariensis*** (Henn.) Hendrickx, Publ. Inst. Natl. Étude Agron. Congo Belge, sér. Sci., 35: 7. 1948.

Stromata, perithecia, ostioles, and asci much as in ***K. deusta***. Ascospores dark brown to blackish brown, unicellular, fusoid to ellipsoid, inequilateral, with acute ends often pinched and blackened, smooth, 21-34 x 8.5-12 μm, with straight germ slit spore-length or nearly so.

Cultures much as described for ***K. clavus***. Anamorph sometimes produced in culture. Sporulating regions, conidiophores, and conidiogenous cells as in ***K. sandvicensis***. Conidia hyaline, smooth, ellipsoid to short cylindrical, 5.5-7.5 x 2-3 μm, with flattened base indicating former point of attachment to conidiogenous cell.

SPECIMENS EXAMINED: CUBA: Central Trinidad, Iznaga Prov., Santa Clara, 21.XI.1924, Weir, J. R., wood of ***Cailliea glomerata***, as ***Ustulina zonata*** by Weir, J. R. (BPI 586819; GZU-Petrak 1075). FRENCH GUIANA: Säul, Circuit Grand Fosse, elev. 300-350 m, 10.II.1986, Samuels, G. J. 3633, bark (JDR; NY). GUADELOUPE: Terre de Bas, I.1994, Vivant, J., wood (JDR). MEXICO: Veracruz, IX.1987, Delgado, J. C., wood of ***Citrus*** (JDR); Quintana Roo State, José María Morelos Municipality, Zafarrancho, 6.II.1986, Guerava 773, living ***Citrus*** tree (ITCV; JDR). PUERTO RICO: 19.I.1916, wood, as ***Ustulina zonata*** by Diehl, W. W. (BPI 586874); Mayagüez, Earle, F. S. 247, wood, as ***Ustulina zonata*** by Diehl, W. W. (BPI 587147). TAIWAN: Ping-tung Co., Heng-chun, Ken-ting, 23.VIII.1988, Ju, Y.-M. 77082304 (CULTURED), tree root (JDR).

NOTES: ***Kretzschmaria zonata*** and ***K. deusta*** differ mainly in ascospore features. The former has darker, broader ascospores with a spore-length germ slit. The ends of mature ascospores are so deeply blackened that the germ slits look as if they are less than spore-length. ***Kretzschmaria zonata*** is widely distributed in the tropics and subtropics. It has been reported as a pathogen on a number of important tropical perennial crops (see earlier herein). Petch (1912, 1923, 1924, 1928) was inconsistent in his concept of ***K. zonata*** (as ***Ustulina***). Petch (1912) expressed the opinion that ***K. zonata*** and ***K. deusta*** (as ***U. vulgaris***) are identical. In 1923 he discussed the fungus as ***U. zonata*** in relation to the disease of tea bush. In 1924 he accepted it as distinct from ***U. vulgaris***. Influenced by Van

Overeem's assertion that *U.* ***vulgaris*** and *U.* ***zonata*** are identical, he (1928) once again writes that *U.* ***vulgaris*** and *U.* ***zonata*** are identical.

We were unable to locate the type of ***Sphaeria zonata***, as was Petch (1928). We have not studied the type of ***Ustulina vulgaris*** *f.* ***madagascariensis***. This fungus was reported to have ascospores 20-28 x 7-10 μm (see Dennis, 1963) and very likely belongs here.

NEW COMBINATIONS

Xylaria apoda (Berk. & Broome) J. D. Rogers & Y.-M. Ju, *comb. nov.*
Figs. 13, 49

≡ ***Hypoxylon coenopus*** (Fr.: Fr.) Mont. *var.* ***apoda*** Berk. & Broome, J. Linn. Soc., Bot. 14: 120. 1873.
≡ ***Kretzschmaria coenopus*** (Fr.: Fr.) Sacc. *var.* ***apoda*** (Berk. & Broome) Petch, Ann. Roy. Bot. Gard. (Peradeniya) 8: 135. 1924.
≡ ***Kretzschmaria turbinata*** Petch, Ann. Roy. Bot. Gard. (Peradeniya) 8: 136. 1924; *non* (Ellis & Everhart) C. G. Lloyd, 1921; [*nom. rejic.*, ICBN Art. 53.1].
= ? ***Kretzschmaria microspora*** Henn., Hedwigia 43: 261. 1904.
= ***Kretzschmaria gomphoidea*** Penz. & Sacc. *var.* ***microspora*** Rehm, Leafl. Philipp. Bot. 6: 2206. 1914.

Stromata with convex or flattened, turbinate or obconical fertile parts 1-2.5 mm diam, containing a number of perithecia, highly crowded or fused at top into masses, tapering downwards into cylindrical glabrous stipes or sessile; surface dark brown to dull black, smooth to rugulose on top, corky-cracked on sides and stipes; thin, carbonaceous tissue immediately beneath surface; tissue between and beneath perithecia coriaceous, white, becoming dark brown and disintegrating. Perithecia spherical, 0.4-0.7 mm diam. Ostioles slightly papillate, with or without a surrounding disc. Asci 150-165 μm total length x 5-6 μm broad, the spore-bearing parts 60-80 μm long, the stipes 80-90 μm long, with apical ring bluing in Melzer's iodine reagent, inverted hat-shaped, 1.5-2 μm high x 2 μm broad. Ascospores light brown, unicellular, fusoid-inequilateral or crescentic, with narrowly rounded ends, smooth, 9-11 x 3.5-4.5 μm, with straight germ slit slightly less than spore-length on the flattened or concave side.

Colonies on 2% Difco oatmeal agar at ca. 20°C and under 12 h fluorescent light reaching the edge of 9 cm Petri dish in 2 wk, at first white, velvety, appressed, zonate, with narrowly plumose advancing margins, turning blackish from center outwards and becoming overlain with floccose hyphae. Reverse uncolored. Stromata produced at periphery of colonies, cylindrical, up to 2 mm high x 0.8 mm broad at base, initially white, becoming blackish. Sporulating regions on the upper surface of stromata. Conidiophores in upright palisades, di- or trichotomously branched several times from base, brownish, smooth. Conidiogenous cells terminal, cylindrical, 12-18 x 2.8-3.5 μm, yellowish, smooth, bearing terminal poroid conidial secession scars 0.7-1 μm diam. Conidia produced holoblastically in sympodial sequence. Conidia pale olive (olivaceous in masses), smooth, ellipsoid to fusoid, 6-10(-12) x 2.5-3.5 µm, with flattened base 1.2-1.5 µm indicating former point of attachment to conidiogenous cell.

SPECIMENS EXAMINED: PHILIPPINES: Los Baños, 15.X.1913, Baker, C. F., decorticated trunk (S, HOLOTYPE of ***Kretzschmaria gomphoidea*** *var.* ***microspora***); Mt. Makiling, X.1920, Reinking, O. A., wood, as ***Kretzschmaria gomphoidea*** *var.* ***microspora*** (GZU-Petrak 1378). SRI LANKA: Peradeniya, II.1917, Petch, T. 5204, wood, as ***Kretzschmaria turbinata*** Petch, also as ***Kretzschmaria coenopus*** *var.* ***apoda*** (K 52690). TAIWAN: Ping-tung Co., Heng-chun, Ken-ting, 23.VII.1987, Ju, Y.-M. 76072305 (CULTURED), wood (JDR); I-lan Co., Ta-tung, Chi-lan-shan, 14.IX.1991, Ju, Y.-M. 80091413, bark (JDR).

NOTES: ***Hypoxylon coenopus*** (Fr.: Fr.) Mont. is a synonym of ***Kretzschmaria coenopus*** (Fr.: Fr.) Sacc., now considered to be a synonym of ***K. clavus*** (Fr.: Fr.) Sacc. ***Hypoxylon coenopus*** *var.* ***apoda*** is not a variety of ***K. coenopus*** and, indeed, is not even a ***Kretzschmaria***. Morphologically and culturally it is a ***Xylaria***! Cultures are reminiscent of those of ***X. multiplex*** (Kunze: Fr.) Fr. ***Xylaria apoda*** is easily confused with ***X. heliscus*** and, indeed, one of its synonyms, ***K. turbinata*** Petch, was synonymized with the latter by Dennis (1957) [under ***Kretzschmaria***]. ***Xylaria apoda*** differs from ***X. heliscus*** in having narrow and light brown ascospores that are fusoid-inequilateral or crescentic, in having the stromatal interior becoming hollow with age, in having conidiogenous cells bearing poroid secession scars, and in having longer and narrower conidia. ***Xylaria apoda*** is known mainly from Asiatic tropics and subtropics. ***Kretzschmaria microspora*** [BRAZIL: Amazonas, Rio Jurua, Jurua Miry, VIII.1901, Ule, bark (S, TYPE)] is probably a synonym of ***X. apoda***. However, the type material is too scanty to establish a synonymy. San Martín and Rogers (1993) reported a similar fungus "***Kretzschmaria*** sp. aff. ***heliscus***" from Mexico. This fungus differs from ***X. apoda*** in completely lacking discs surrounding the ostioles and in having conspicuous hairs on the stromatal stipes. Cultures and anamorph of the Mexican fungus highly resemble those of ***X. apoda***.

We did not see the type of ***H. coenopus*** *var.* ***apoda*** which is the part of Thwaites' collection no. 60 with ascospores about 10 µm long (see Petch, 1924 and NOTES on ***X. heliscus*** herein). Petch's diagnosis and specimen from Sri Lanka at K, however, leave little doubt as to the identity of ***H. coenopus*** *var.* ***apoda***. It should be noted that the epithet ***apoda***, in fact, is not descriptive for this fungus which is more commonly stipitate.

Kretzschmaria chardoniana (J. H. Miller) P. Martin [≡ ***Penzigia chardoniana*** J. H. Miller] appears to be closely related to ***X. apoda***. They have a similar ascospore morphology except that the former has ascospores 11.5-13 x 4.5-5.5 µm.

Xylaria heliscus (Mont.) J. D. Rogers & Y.-M. Ju, *comb. nov.*

Fig. 12

≡ ***Hypoxylon heliscus*** Mont., Ann. Sci. Nat. Bot., sér. II, 13: 355. 1840.
≡ ***Poronia heliscus*** (Mont.) Mont., Ann. Sci. Nat. Bot., sér. IV, 3: 114. 1855.
≡ ***Kretzschmaria heliscus*** (Mont.) Massee, Kew Bull. 1898: 118. 1898.

= ***Rhopalopsis berkeleyanum*** Cooke, Grevillea 12: 2. 1883.

≡ ***Kretzschmaria berkeleyana*** (Cooke) Berl. & Voglino, Add. Syll. Fung., p. 56. 1886.

= ***Kretzschmaria gomphoidea*** Penz. & Sacc., Malpighia 11: 493. 1897.

See Dennis (1957) [as ***Kretzschmaria***] and Rogers et al. (1987) [as ***Kretzschmaria***] for descriptions of the teleomorph. Ascospores dark brown, broad ellipsoid-inequilateral, with broadly to narrowly rounded ends, 9-11 x (4.5-)5-6 μm, with germ slit slightly less than spore-length to spore-length on the less convex side.

See San Martín and Rogers (1993) [as ***Kretzschmaria***] for a description of cultures and anamorph.

SPECIMENS EXAMINED: BRAZIL: Rio de Janeiro, no date, Glaziou 8542, wood (K 52686, LECTOTYPE [selected by Petch (1924)] of ***Rhopalopsis berkeleyanum***). FRENCH GUIANA: 1838, Leprieur 252, wood (K, ISOTYPE of ***Hypoxylon heliscus***). MALAYSIA: Kuala Lumpur, 20.VI.1928, Weir, J. R., bark , as ***Kretzschmaria heliscus*** (GZU-Petrak 1384). PHILIPPINES: Mt. Maquiling, wood, as ***Kretzschmaria heliscus*** by Lloyd, C. G. (GZU-Petrak 1381); Mt. Maquiling, 25.X.1920, bark, as ***Kretzschmaria heliscus*** by Lloyd, C. G. (GZU-Petrak 1365); Luzon, Prov. of Tayabas, Basiad, XII.1916, Yates, H. S. 25678, wood, as ***Kretzschmaria gomphoidea*** by Dennis, R. W. G. (K); Prov. of Tayabas, Mt. Cadig, XII.1916, Yates, H. S. 25794, wood, as ***Kretzschmaria gomphoidea*** (GZU-Petrak 1362).

NOTES: ***Xylaria heliscus*** is widely distributed in the tropics and subtropics. Although the stromata are kretzschmarioid, other features—including a stromatal interior that does not become hollow with age, a thin and noncarbonaceous outer stromatal layer, and small ascospores—suggest its placement in ***Xylaria***. As has been suggested by Dennis (1956, 1957), ***Xylaria heliscus*** appears to be closely related to ***X. feejeensis*** (Berk.) Fr. and its kin.

Cooke (1883) cited three specimens in the protologue of ***Rhopalopsis berkeleyanum***: Glaziou 8542, Glaziou 8543, and Thwaites 60. Glaziou 8542 and 8543 are from Brazil and were glued to the same paper card. Glaziou 8542 was designated by Petch (1924) as the type of ***Rhopalopsis berkeleyanum***. Glaziou 8543 is ***Xylaria rhytidophloea*** Mont. Thwaites 60 had been examined by Petch (1924) who remarked that it is composed of two fungi—***K. micropus*** and ***Hypoxylon coenopus** var. **apoda*** Berk. & Broome. He believed that Cooke (1883) intended to refer to the material of ***H. coenopus** var. **apoda***, which has ascospores ca. 10 μm long, in the protologue of ***R. berkeleyanum***. However, Petch (1924) did not consider ***H. coenopus** var. **apoda*** to be the same as ***R. berkeleyanum*** but proposed a new name, ***Kretzschmaria turbinata***, for it. Unfortunately, the epithet ***turbinata*** had been combined with ***Kretzschmaria*** by Lloyd (1921) with the basionym ***Poronia turbinata*** Ellis & Everhart. Petch's ***K. turbinata*** was synonymized with ***K. heliscus*** by Dennis (1957). We, on the other hand, consider Petch's fungus to be distinct from ***K. heliscus*** (see ***Xylaria apoda***).

Kretzschmaria scruposa Har. & Pat. Is a closely related taxon. It probably represents a large-spored form of ***X. heliscus***, having ascospores 11-13 x 5.5-6 µm.

Xylaria intracolorata (J. D. Rogers, Callan, & Samuels) J. D. Rogers & Y.-M. Ju, *comb. nov.* Fig. 50
≡ ***Kretzschmaria intracolorata*** J. D. Rogers, Callan, & Samuels, Mycotaxon 29: 140. 1987.

See Rogers et al. (1987) for a description of the teleomorph.

Colonies on 2% Difco oatmeal agar at ca. 20°C and under 12 h fluorescent light reaching the edge of 9 cm Petri dish in 2 wk, at first pinkish, velvety to felty, zonate, with diffuse margins, then becoming overlain with irregular blackish patches upon which stromata are produced. Reverse uncolored. Stromata densely aggregated or even coalescent, pulvinate to shortly cylindrical, 1-3 mm high x 1-2 mm diam, at first white or yellowish, becoming overlain with blackish hyphae from base upwards. Sporulating regions on the upper surface of stromata. Conidiophores in upright dense palisades, di- or trichotomously branched several times from base, olivaceous brown, smooth. Conidiogenous cells proliferating indeterminately, cylindrical, 8-20 x 4-5 µm, hyaline to pale olivaceous brown, smooth, bearing lateral and terminal dome-shaped conidial secession scars 0.5 µm high x 1 µm diam. Conidia produced holoblastically in sympodial sequence. Conidia hyaline to pale olive (olive in masses), smooth, ellipsoid to ellipsoid-inequilateral, 5-10 x 3.5-5 µm, with flattened base 1 µm broad indicating former point of attachment to conidiogenous cell.

SPECIMEN EXAMINED: INDONESIA: North Sulawesi, Dumoga-Bone National Park, vic. 'Camp Edwards', 0°35'N, 123°51'E, elev. 664 m, X.1985, Samuels, G. J. 2079, recently fallen tree (BO, HOLOTYPE; JDR; NY, ISOTYPES of ***Kretzschmaria intracolorata***). TAIWAN: Nan-tou Co., Lu-ku, Shi-tou, 22.VIII.1987, Ju, Y.-M. 76082211 (CULTURED) & 76082225 (CULTURED), dead wood (JDR).

NOTES: ***Xylaria intracolorata*** differs from ***X. heliscus*** mainly in the presence of orange granules immediately beneath surface and between perithecia. The ascospore morphology of ***X. intracolorata*** resembles that of ***X. heliscus***.

LIST OF NAMES

Accepted or suggested disposition is indicated by an asterisk. Probable disposition is indicated by a question mark.

abyssinicum (***Hypoxylon***) Sacc. = * ***Kretzschmaria micropus*** (Fr.: Fr.) Sacc.

aggregata (***Kretzschmaria***) (Welw. & Curr.) Sacc. ≡ ***Hypoxylon aggregatum*** Welw. & Curr. ≡ ***Rhopalopsis aggregatum*** (Welw. & Curr.) Cooke = * ***Kretzschmaria micropus*** (Fr.: Fr.) Sacc.

albocephalum (***Kretzschmaria***) C. G. Lloyd, Mycol. Writings 7: 1313. 1924.

ZAIRE: “Belgian Congo”, Vanderyst, H., wood (BPI 716370 [Lloyd herb. 12602], HOLOTYPE of ***Kretzschmaria albocephalum***).

Type is immature. It is possibly a ***Rhopalostroma*** species.

albodeusta (***Sphaeria***) Wahlenb. = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

angolensis (***Kretzschmaria***) (Welw. & Curr.) Sacc., Syll. Fung. IX, p. 565. 1891.

≡ ***Hypoxylon angolense*** Welw. & Curr., Trans. Linn. Soc. 26: 282. 1867.

≡ ***Daldinia angolensis*** (Welw. & Curr.) Sacc., Syll. Fung. I, p. 394. 1882.

≡ ***Rhopalopsis angolense*** (Welw. & Curr.) Cooke, Grevillea 11: 93. 1883.

≡ * ***Rhopalostroma angolense*** (Welw. & Curr.) D. Hawksworth, Kew Bull. 31: 424. 1977.

apoda (***Kretzschmaria***) C. G. Lloyd = * ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

apus (***Kretzschmaria***) Rick, Egatea 8: 4. 1923. [*nom. nud.*?]; Archiv. Mus. Nac. Rio de Janeiro 36: 68. 1934.

Rick (1934) considered Lloyd’s ***K. apoda*** to be the same as his ***K. apus***.

arntzenii (***Kretzschmaria***) (Theiss.) P. Martin, J. S. African Bot. 42: 74. 1976.

≡ ***Penzigia arntzenii*** Theiss., Ann. Mycol. 6: 346. 1908.

≡ ***Xylosphaera arntzenii*** (Theiss.) Dennis, Kew Bull., add. Ser., 3: 303. 1970.

BRAZIL: Rick, J., herbaceous stem (GAM 12817 *ex* Lloyd herb. 11211, TYPE of ***Penzigia arntzenii***).

A penzigioid ***Xylaria***. It is a later synonym of ***Nummularia albocincta*** Rehm.

atrosphaerica (***Kretzschmaria***) (Cooke & Massee) P. Martin, J. S. African Bot. 42: 74. 1976.

≡ ***Hypoxylon atrosphaericum*** Cooke & Massee *apud* Cooke, Grevillea 22: 68. 1894.

≡ * ***Xylaria atrosphaerica*** (Cooke & Massee) Callan & J. D. Rogers, Mycotaxon 36: 349. 1990.

australiensis (***Kretzschmaria***) Henn. = * ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

bengalensis (***Kretzschmaria***) Narula & Rawla, Nova Hedwigia 40: 242. 1984 (1985).

INDIA: West Bengal, Darjeeling, 30.VIII.1980, Narula, A. M. 545, gymnospermous stump (JDR, TYPE of ***Kretzschmaria bengalensis***).

= * ***Hypoxylon cohaerens*** (Pers.: Fr.) Fr. *var.* ***microsporum*** J. D. Rogers & Cand.

See Rogers and Candoussau (1980) and Ju and Rogers (1996) for descriptions of ***H. cohaerens*** *var.* ***microsporum***.

berkeleyana (***Kretzschmaria***) (Cooke) Berl. & Voglino ≡ ***Rhopalopsis berkeleyanum*** Cooke = * ***Xylaria heliscus*** (Mont.) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

botrites (***Kretzschmaria***) C. G. Lloyd = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

brachyspora (***Ustulina***) Speg., Anales Soc. Ci. Argent. 90: 172. 1921.

We have not seen material of this fungus. Ascospores were reported as 14 x 7 µm (Saccardo, 1928).

brasiliensis (***Ustulina***) Speg. = ? ***Kretzschmaria pavimentosa*** (Ces.) P. Martin

bulgarioides (***Kretzschmaria***) Rehm = * ***Kretzschmaria pavimentosa*** (Ces.) P. Martin

caespitosa (***Nummularia***) Pat., Bull. Soc. Mycol. France 4: 110. 1888.

The type was not found at FH. Judging from the protologue, there is little doubt that Patouillard's fungus is a ustulinoid ***Kretzschmaria***.

caespitosa (***Nummularia***) Pat. *var.* ***areolata*** Rehm, Hedwigia 40: 141. 1901.

We were unable to locate the type at S. Rehm's protologue and illustrations indicate that this is a ustulinoid ***Kretzschmaria***.

* ***cetrarioides*** (***Kretzschmaria***) (Welw. & Curr.) Sacc. ≡ ***Hypoxylon cetrarioides*** Welw. & Curr. ≡ ***Rhopalopsis cetrarioides*** (Welw. & Curr.) Cooke

chardoniana (***Kretzschmaria***) (J. H. Miller) P. Martin, J. S. African Bot. 42: 74. 1976.

≡ ***Penzigia chardoniana*** J. H. Miller *apud* Chardon & Toro, Monogr. Univ. Puerto Rico, B., ser. 2: 211. 1934.

VENEZUELA: Edo. Aragua, Ravines on road Maracay to Ocumare, 25.VII.1932, Chardon, C. E. & Toro, R. A. 656, wood (GAM 4870, ISOTYPE of ***Penzigia chardoniana***).

It is close to ***Xylaria apoda***. See NOTES on ***X. apoda*** herein.

* ***clavus*** (***Kretzschmaria***) (Fr.: Fr.) Sacc. ≡ ***Sphaeria clavus*** Fr.: Fr. ≡ ***Hypoxylon clavus*** (Fr.: Fr.) Mont. ≡ ***Rhopalopsis clavus*** (Fr.: Fr.) Cooke

coenopus (***Kretzschmaria***) (Fr.: Fr.) Sacc. ≡ ***Sphaeria coenopus*** Fr.: Fr. ≡ ***Hypoxylon coenopus*** (Fr.: Fr.) Mont. ≡ ***Xylaria coenopus*** (Fr.: Fr.) Berk. & M. A. Curtis ≡ ***Rhopalopsis coenopus*** (Fr.: Fr.) Cooke = * ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

coenopus (***Kretzschmaria***) (Fr.: Fr.) Sacc. *var.* ***apoda*** (Berk. & Broome) Petch ≡ ***Hypoxylon coenopus*** (Fr.: Fr.) Mont. *var.* ***apoda*** Berk. & Broome ≡ * ***Xylaria apoda*** (Berk. & Broome) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

colensoi (***Kretzschmaria***) (Berk.) Sacc., Syll. Fung. II, p. xxix. 1883.

≡ ***Hypoxylon colensoi*** Berk. *apud* Hook., Handb. of N. Zealand Fl., p. 756. 1867.

NEW ZEALAND: Colenso 4632, wood (K, HOLOTYPE of ***Hypoxylon colensoi***).

The type material is immature and fragmentary. Two larger fragments of stromata showing concentric rings suggest that this fungus is a ***Daldinia***.

confusa (***Kretzschmaria***) (Berk. & Cooke) Sacc., Syll. Fung. II, p. xxix. 1883.

≡ ***Rhopalopsis confusum*** Berk. & Cooke *apud* Cooke, Grevillea 11: 94. 1883.
BRAZIL: Prainha, 6.XII.1873, Frail, J. W. H. 16, wood, as ***Hypoxylon confusum*** *ined*. (K 52687, HOLOTYPE of ***Rhopalopsis confusum***).
The type material is sterile.

congesta (***Kretzschmaria***) (Berk. & Broome) Sacc., Syll. Fung. II, p. xxix. 1883.
≡ ***Hypoxylon congestum*** Berk. & Broome, J. Linn. Soc., Bot. 14: 120. 1873; *non* (Hino & Katumoto) Ahmad, 1978.
≡ ***Rhopalopsis congestum*** (Berk. & Broome) Cooke, Grevillea 11: 94. 1883.
SRI LANKA: 7.1868, Thwaites, G. H. K. 637, corticated wood (K, HOLOTYPE of ***Hypoxylon congestum***).
The type material is sterile. See Ju and Rogers (1996).

congregata (***Holttumia***) C. G. Lloyd = * ***Kretzschmaria macrosperma*** (Mont.) J. D. Rogers & Y.-M. Ju

contracta (***Rhopalopsis***) (Speg. *ex* Sacc.) Cooke, Grevillea 11: 94. 1883.
≡ ***Xylaria contracta*** Speg. *ex* Sacc., Syll. Fung. I, p. 326. 1882.
Saccardo (1882) mentioned that this fungus has an affinity with ***Xylaria puiggarii*** [= ***K. clavus***].

* ***curvirima*** (***Kretzschmaria***) J. D. Rogers & Y.-M. Ju

decipiens (***Ustulina***) Rehm, *ined*.
PHILIPPINES: Los Baños, 5.IX.1913, Raimundo, M. B. 1673, rotten log, as ***Ustulina decipiens*** Rehm n. sp. (S).
This is ***Hypoxylon nicaraguense*** Ellis & Everh. See Ju and Rogers (1996) for a description.

* ***deusta*** (***Kretzschmaria***) (Hoffm.: Fr.) P. Martin ≡ ***Sphaeria deusta*** Hoffm.: Fr. ≡ ***Discosphaera deusta*** (Hoffm.: Fr.) Dumort. ≡ ***Stromatosphaeria deusta*** (Hoffm.: Fr.) Grev. ≡ ***Hypoxylon deustum*** (Hoffm.: Fr.) Grev. ≡ ***Ustulina deusta*** (Hoffm.: Fr.) Petrak

deusta (***Sphaeria***) Hoffm.: Fr. *var.* ***platyceps*** Pers., Observ. Mycol. I, p. 19. 1796.
We have not seen material of this fungus. The description and illustrations in Persoon (1796) suggest that this name represents a morph of ***K. deusta*** that has a short, slender stipe.

divergens (***Kretzschmaria***) Starb. = * ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

* ***eriodendri*** (***Kretzschmaria***) (Henn.) J. D. Rogers & Y.-M. Ju ≡ ***Hypoxylon eriodendri*** Henn.

erythraeae (***Kretzschmaria***) Baccarini & Sacc. = * ***Kretzschmaria micropus*** (Fr.: Fr.) Sacc.

fragaria (***Hypoxylon***) Ces. = * ***Kretzschmaria macrosperma*** (Mont.) J. D. Rogers & Y.-M. Ju

frustulosa (***Kretzschmaria***) (Berk. & M. A. Curtis) P. Martin, J. S. African Bot. 42: 74. 1976.
≡ ***Hypoxylon frustulosum*** Berk. & M. A. Curtis *apud* Berk., J. Linn. Soc., Bot. 10: 383. 1869.
≡ ***Nummularia frustulosa*** (Berk. & M. A. Curtis) Sacc., Syll. Fung. I, p.

398. 1882.

≡ * ***Xylaria frustulosa*** (Berk. & M. A. Curtis) Cooke, Grevillea 12: 5. 1883.

≡ ***Penzigia frustulosa*** (Berk. & M. A. Curtis) J. H. Miller *apud* Chardon & Toro, Monogr. Univ. Puerto Rico, B., ser. 2: 211. 1934.

CUBA: Wright, C. 497, wood (FH, ISOTYPE of ***Hypoxylon frustulosum***).

gigaspermum (***Hypoxylon***) Henn. & E. Nyman = ? ***Kretzschmaria macrosperma*** (Mont.) J. D. Rogers & Y.-M. Ju

gigaspora (***Nummularia***) Pat., *ined.* = * ***Kretzschmaria sandvicensis*** (Reichardt) J. D. Rogers & Y.-M. Ju

gomphoidea (***Kretzschmaria***) Penz. & Sacc. = * ***Xylaria heliscus*** (Mont.) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

gomphoidea (***Kretzschmaria***) Penz. & Sacc. *var.* ***microspora*** Rehm = * ***Xylaria apoda*** (Berk. & Broome) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

guaranitica (***Kretzschmaria***) Speg., Anales Soc. Ci. Argent. 18: 276. 1884.

≡ * ***Xylaria guaranitica*** (Speg.) Dennis, Kew Bull. 1956: 441. 1956.

≡ ***Xylosphaera guaranitica*** (Speg.) Dennis, Kew Bull. 1958: 104. 1958.

* ***guyanensis*** (***Kretzschmaria***) J. D. Rogers & Y.-M. Ju

heliscus (***Kretzschmaria***) (Mont.) Massee ≡ ***Hypoxylon heliscus*** Mont. ≡ ***Poronia heliscus*** (Mont.) Mont. ≡ * ***Xylaria heliscus*** (Mont.) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

intracolorata (***Kretzschmaria***) J. D. Rogers, Callan, & Samuels ≡ * ***Xylaria intracolorata*** (J. D. Rogers, Callan, & Samuels) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

knysnana (***Kretzschmaria***) Van der Bijl, Ann. Univ. Stellenbosch X, Reeks A, Afl. 2: 5. 1932.

SOUTH AFRICA: Knysna, XII.1930, Van der Bijl, P. A. 2549, wood (K, TYPE of ***Kretzschmaria knysnana***).

A ***Xylaria*** belonging to the ***X. polymorpha*** complex. Dennis (1958, 1961) listed this name as a synonym of ***Xylaria anisopleura*** (Mont.) Fr.

kurziana (***Kretzschmaria***) (Curr.) Sacc., Syll. Fung. II, p. xxix. 1883.

≡ ***Xylaria kurziana*** Curr., Trans. Linn. Soc. London, Bot. Ser. II, 1: 129. 1876.

≡ ***Rhopalopsis kurziana*** (Curr.) Cooke, Grevillea 11: 94. 1883.

= * ***Stromatoneurospora phoenix*** (Kunze: Fr.) S. C. Jong & E. E. Davis. *Fide* Rogers et al. (1992).

lichenoides (***Kretzschmaria***) (Berk. *ex* Cooke) Sacc., Syll. Fung. II, p. xxix. 1883; *non* Rick, 1904.

≡ ***Rhopalopsis lichenoides*** Berk. *ex* Cooke, Grevillea 11: 94. 1883.

We have not seen material of this fungus. We requested type or authentic material from K. Only the type material of ***K. lichenoides*** Rick was sent to us.

lichenoides (***Kretzschmaria***) Rick *non* (Berk. *ex* Cooke) Sacc. = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

linearis (***Ustulina***) Rehm, Hedwigia 31: 310. 1892.

GERMANY: Berlin, Bot. Gard., 1890, Sydow, Rehm's Ascomyc. 1089, wood of ***Betula*** (BPI 739249 [*ex* NY], TYPE of ***Ustulina linearis***); Berlin, Bot. Gard., 1890, Sydow, Sydow's Myc. Marchica 2859, wood of ***Betula*** (BPI 739250, TYPE of ***Ustulina linearis***).

This is conspecific with ***Sphaeria diffusa*** Sowerby, a ***Nemania*** species.

* ***lucidula*** (***Kretzschmaria***) (Mont.) Dennis ≡ ***Hypoxylon lucidulum*** Mont.

* ***macrosperma*** (***Kretzschmaria***) (Mont.) J. D. Rogers & Y.-M. Ju ≡ ***Hypoxylon macrospermum*** Mont. ≡ ***Ustulina macrosperma*** (Mont.) Sacc.

macrospora (***Nummularia***) Pat. = * ***Kretzschmaria sandvicensis*** (Reichardt) J. D. Rogers & Y.-M. Ju

magnosporum (***Hypoxylon***) C. G. Lloyd = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

mauritanica (***Kretzschmaria***) (Durieu & Mont.) Pat., Bull. Soc. Mycol. France 21: 120. 1905.

≡ ***Sphaeria mauritanica*** Durieu & Mont. *apud* Durieu, Fl. Algér. Crypt. I, p. 45. 1846-49.

≡ ***Hypoxylon mauritanicum*** (Durieu & Mont.) Mont., Syll. Gen. Sp. Crypt., p. 211. 1856.

MAURITANIA: La Calle, Durieu, M., wood (FH, TYPE of ***Sphaeria mauritanica***).

A ***Xylaria*** species.

maxima (***Ustulina***) (Weber) Wettst. ≡ ***Sphaeria maxima*** Weber ≡ ***Nemania maxima*** (Weber) House = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

maxima, ***convexa***, ***nigerrima*** (***Sphaeria***) Haller = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

* ***megalospora*** (***Kretzschmaria***) J. D. Rogers & Y.-M. Ju

microcephala (***Kretzschmaria***) (Mont.) Sacc., Syll. Fung. II, p. xxix. 1883.

≡ ***Xylaria microcephala*** Mont. *apud* C. Gay, Fl. Chilena VII, p. 432. 1852.

≡ ***Rhopalopsis microcephala*** (Mont.) Cooke, Grevillea 11: 94. 1883.

We have not seen material of this fungus.

* ***micropus*** (***Kretzschmaria***) (Fr.: Fr.) Sacc. ≡ ***Sphaeria micropus*** Fr.: Fr. ≡ ***Hypoxylon micropus*** (Fr.: Fr.) Berk. ≡ ***Rhopalopsis micropus*** (Fr.: Fr.) Cooke

microsperma (***Ustulina***) Traverso *ex* Sacc., Syll. Fung. XXII, p. 334. 1913.

≡ ***Ustulina microspora*** Traverso, Fl. Ital. Crypt. I, p. 37. 1906; *non* Speg., 1884; [*nom. rejic.*, ICBN Art. 53.1].

We have not seen material of this fungus.

microspora (***Kretzschmaria***) Henn. = ? ***Xylaria apoda*** (Berk. & Broome) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

microspora (***Ustulina***) Speg., Anales Soc. Ci. Argent. 18: 268. 1884; *non* Traverso, 1906.

PARAGUAY: Guarapi, VI.1883, Balansa, B., Pl. du Paraguay 3780, bark (GZU-Petrak, TYPE of ***Ustulina microspora***).

This is a synonym of ***Hypoxylon cantareirense*** Henn. [≡ ***Penzigia cantareirensis*** (Henn.) J. H. Miller], a penzigioid ***Xylaria***.

microspora (***Ustulina***) Traverso, Fl. Ital. Crypt. I, p. 37. 1906; *non* Speg., 1884; [*nom. rejic*., ICBN Art. 53.1].

≡ ***Ustulina microsperma*** Traverso *ex* Sacc., Syll. Fung. XXII, p. 334. 1913.

* ***milleri*** (***Kretzschmaria***) J. D. Rogers & Y.-M. Ju

mori (***Ustulina***) Hara, J. Sericultural Assoc., Japan 26: 389. 1917, (in Japanese); Mycologia 10: 91. 1918.

Ascospores are 7-10 x 4-5 µm. It was said to differ from ***Ustulina microspora*** in the shape and dimensions of ascospores. We have not seen material of this fungus.

* ***neocaledonica*** (***Kretzschmaria***) (Har. & Pat.) J. D. Rogers & Y.-M. Ju ≡ ***Hypoxylon neocaledonicum*** Har. & Pat.

novoguineensis (***Kretzschmaria***) Henn. = ? ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

nucele (***Hypoxylon***) C. G. Lloyd = * ***Kretzschmaria macrosperma*** (Mont.) Sacc.

nucigenum (***Hypoxylon***) Henn. = * ***Kretzschmaria macrosperma*** (Mont.) Sacc.

paradoxa (***Kretzschmaria***) Pat. = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

* ***pavimentosa*** (***Kretzschmaria***) (Ces.) P. Martin ≡ ***Hypoxylon pavimentosum*** Ces. ≡ ***Ustulina pavimentosa*** (Ces.) Cooke

pechuelii (***Kretzschmaria***) Henn. = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

phoenicis (***Kretzschmaria***) S. B. Kale & V. S. Kale, Sydowia 24: 332. 1970.

In the protologue, the ascospores were described as 11-14 x 5-6 µm, with a hyaline, thin mucous sheath. It appears that this is a penzigioid ***Xylaria***.

placentiformis (***Ustulina***) Rehm, Leafl. Philipp. Bot. 6: 2207. 1914.

PHILIPPINES: Mt. Makiling, near Los Baños, 24.V.1913, Raimundo, M. B. 1184, rotten log (S, SYNTYPE of ***Ustulina placentiformis***).

Two specimens were cited in the protologue. However, only one was located at the Rehm herbarium of S. Unfortunately, it contains only sterile material of a ***Hypoxylon*** species.

placentiformis (***Ustulina***) Rehm var. ***magnifica*** Rehm, Leafl. Philipp. Bot. 6: 2207. 1914.

PHILIPPINES: Mt. Makiling, near Los Baños, 10.XII.1913, Baker, C. F. 2133, rotten log (S, HOLOTYPE of ***Ustulina placentiformis*** *var.* ***magnifica***).

= * ***Hypoxylon symphyon*** Möller. See Ju and Rogers (1996) for a description.

proxima (***Kretzschmaria***) Pat. = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

pseudotubulina (***Hypoxylon***) Ces. *var.* ***macrosperma*** Theiss., Ann. Mycol. 6: 346. 1908.

≡ ***Hypoxylon verrucosum*** Theiss. *var.* ***macrosperma*** (Theiss.) Theiss., Ann. Mycol. 7: 142. 1909.

≡ ***Hypoxylina verrucosa*** (Theiss.) Rick *f.* ***macrosperma*** (Theiss.) Rick, Archiv. Mus. Nac. Rio de Janeiro 36: 71. 1934.

Probably a ***Kretzschmaria***. We were unable to locate the type.

pseudotubulina (***Hypoxylon***) Ces. *var.* ***macrostroma*** Theiss., Ann. Mycol. 6: 346. 1908.

≡ ***Hypoxylon verrucosum*** Theiss. *f.* ***macrostroma*** (Theiss.) Theiss., Ann. Mycol. 7: 141. 1909.

≡ ***Hypoxylina verrucosa*** (Theiss.) Rick *f.* ***macrostroma*** (Theiss.) Rick, Archiv. Mus. Nac. Rio de Janeiro 36: 71. 1934.

Probably a ***Kretzschmaria***. We were unable to locate the type.

puiggarii (***Kretzschmaria***) (Speg.) Sacc. ≡ ***Xylaria puiggarii*** Speg. ≡ ***Rhopalopsis puiggarii*** (Speg.) Cooke = * ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

pusilla (***Kretzschmaria***) Ellis & Everhart = * ***Kretzschmaria clavus*** (Fr.: Fr.) Sacc.

pyrenocrata (***Ustulina***) Theiss., Ann. Mycol. 6: 347. 1908.

≡ * ***Theissenia pyrenocrata*** (Theiss.) Maubl., Bull. Mycol. Soc. France 30: 52. 1914.

≡ ***Numulariola pyrenocrata*** (Theiss.) P. Martin, J. S. African Bot. 35: 291. 1969; [*nom. inval.*, ICBN Art. 33.2]; J. S. African Bot. 42: 78. 1976.

rehmii (***Kretzschmaria***) (Theiss.) P. Martin, J. S. African Bot. 42: 74. 1976.

≡ ***Stilbohypoxylon rehmii*** Theiss., Ann. Mycol. 6: 344. 1908.

BRAZIL: São Leopoldo, XI.1906, Theissen, F., twigs (S [Sydow herb.], LECTOTYPE [selected by Rogers and Ju (1997)] of ***Stilbohypoxylon rehmii***).

A ***Xylaria*** conspecific with ***X. schreuderiana*** Van der Byl (Rogers and Ju, 1997).

rugosa (***Kretzschmaria***) Earle, Bull. New York Bot. Gard. 3: 311. 1905.

SAINT KITTS: Britton & Powell 337, dead log (GZU-Petrak 2090 [*ex* Lloyd herb.]; K [*ex* NY], ISOTYPES of ***Kretzschmaria rugosa***).

A penzigioid ***Xylaria*** belonging to the ***X. polymorpha*** complex.

* ***sandvicensis*** (***Kretzschmaria***) (Reichardt) J. D. Rogers & Y.-M. Ju ≡ ***Hypoxylon sandvicense*** Reichardt

scruposa (***Kretzschmaria***) Har. & Pat., J. Bot. (Morot) 17: 14. 1903.

NEW CALEDONIA: Jahoué, no date, Bernier, wood (FH, HOLOTYPE; GZU-Petrak 2091 [*ex* Lloyd herb.], ISOTYPE of ***Kretzschmaria scruposa***).

It is close to ***Xylaria heliscus***. See NOTES on ***X. heliscus***.

sessilis (***Kretzschmaria***) Pat., Bull. Soc. Mycol. France 11: 223. 1895.

≡ ***Xylosphaera sessilis*** (Pat.) Dennis, Kew Bull., add. Ser., 3: 302. 1970.

ECUADOR: San Jorge, VII.1892, Lagerheim, G., wood (K, ISOTYPE of ***Kretzschmaria sessilis***).

A penzigioid ***Xylaria***. See also Dennis (1957, 1970).

singaporensis (***Kretzschmaria***) Sacc. = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

sphaericum (***Hypoxylon***) Pat. = * ***Kretzschmaria neocaledonica*** (Har. & Pat.) J. D. Rogers & Y.-M. Ju

sphaerocephala (***Kretzschmaria***) Petch, Ann. Roy. Bot. Gard. (Peradeniya) 8: 138. 1924.

≡ * ***Rhopalostroma sphaerocephalum*** (Petch) D. Hawksw., Kew Bull. 31: 428. 1977.

SRI LANKA: Peradeniya, IX.1916, Petch, T., wood, as ***Kretzschmaria sphaerocephala*** (GZU-Petrak 2092 [*ex* Lloyd herb.]).

spinifera (***Kretzschmaria***) Ellis & Macbride = * ***Kretzschmaria micropus*** (Fr.: Fr.) Sacc.

stilbophora (***Kretzschmaria***) Rehm, Ann. Mycol. 5: 526. 1907.

BRAZIL: Rio Grande do Sul, São Leopoldo, Rick, J., wood (S, HOLOTYPE; K, ISOTYPE of ***Kretzschmaria stilbophora***).

= * ***Hypoxylon lenormandii*** Berk. & M. A. Curtis. See Ju and Rogers (1996) for a description.

tessulata (***Ustulina***) Berk. *ex* Cooke ≡ ***Hypoxylon tessulatum*** Berk., *ined.* = * ***Kretzschmaria sandvicensis*** (Reichardt) J. D. Rogers & Y.-M. Ju

tonkiniana (***Kretzschmaria***) Pat., *ined.*? = * ***Kretzschmaria cetrarioides*** (Welw. & Curr.) Sacc.

truncata (***Kretzschmaria***) Pat. & Gaillard, Bull. Soc. Mycol. France 4: 109. 1888.

≡ * ***Podosordaria truncata*** (Pat. & Gaillard) P. Martin, J. S. African Bot. 42: 80. 1976. *Fide* Rogers et al. (1992).

tuberiformis (***Ustulina***) (Wallr. *ex* Mont.) Cooke, Grevillea 12: 3. 1883.

≡ ***Hypoxylon tuberiforme*** Wallr. *ex* Mont., Ann. Sci. Nat. Bot., sér. IV, 9: 55. 1858.

Saccardo (1882) suspected it to be a ***Ustulina***. Cooke (1883) stated that this fungus "seems to be undoubtedly ***Ustulina***." This fungus was collected from Germany and has ascospores 20-30 x 5 μm.

tubulina (***Ustulina***) (Albertini & Schwein.: Fr.) Schröt. *apud* Cohn, Krypt.-Fl. Schlesien III, 2, p. 465. 1897.

≡ ***Sphaeria tubulina*** Albertini & Schwein., Consp. Fung. Lusat., p. 6. 1805; Albertini & Schwein.: Fr., Syst. Mycol. II, p. 346. 1823.

≡ ***Hypoxylon tubulinum*** (Albertini & Schwein.: Fr.) Fr., Summa Veg. Scand. II, p. 383. 1849.

≡ ***Bolinia tubulina*** (Albertini & Schwein.: Fr.) Sacc., Syll. Fung. I, p. 352. 1882.

≡ ***Nummularia tubulina*** (Albertini & Schwein.: Fr.) J. H. Miller, Trans. Brit. Mycol. Soc. 17: 134. 1932.

≡ * ***Camarops tubulina*** (Albertini & Schwein.: Fr.) Shear, Mycologia 30: 585. 1938. *Fide* Nannfeldt (1972).

≡ ***Numulariola tubulina*** (Albertini & Schwein.: Fr.) P. Martin, J. S. African Bot. 35: 288. 1969; [*nom. inval.*, ICBN Art. 33.2]; J. S. African Bot. 42: 79. 1976.

tuckeri (***Kretzschmaria***) C. G. Lloyd *apud* Stevenson & Cash, Bull. Lloyd Libr. 35 (Mycol. Ser. 8): 9. 1936.

PUERTO RICO: Mayagüez, 29.XI.1924, Tucker, C. M., wood (BPI

718004 [Lloyd herb. 11992], HOLOTYPE of ***Kretzschmaria tuckeri***).

Type material is immature. It is probably close to ***Xylaria heliscus***.

turbinata (***Kretzschmaria***) (Ellis & Everhart) C. G. Lloyd, Mycol. Writings 6: 1033. 1921; *non* Petch, 1924.

≡ ***Poronia turbinata*** Ellis & Everhart *apud* C. L. Smith, Bull. Lab. Nat. Hist. Iowa State Univ. 2: 410. 1893.

NICARAGUA: Castillo Viejo, Smith, C. L., Centr. Amer. Fung. fasc. 1, no. 32, wood (BPI 716935 [Lloyd herb. 11998]; GAM 4912 & 4913, ISOTYPES of ***Poronia turbinata***).

A penzigioid ***Xylaria*** belonging to the ***X. polymorpha*** complex, with ascospores 14.5-19 x 6-7 μm.

turbinata (***Kretzschmaria***) Petch *non* (Ellis & Everhart) C. G. Lloyd ≡ * ***Xylaria apoda*** (Berk. & Broome) J. D. Rogers & Y.-M. Ju. See NEW COMBINATIONS herein.

ustulatum (***Hypoxylon***) Bull. = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

verrucosa (***Kretzschmaria***) (J. H. Miller) P. Martin, J. S. African Bot. 42: 75. 1976.

≡ ***Penzigia verrucosa*** J. H. Miller, Bothalia 4: 261. 1942.

SOUTH AFRICA: Northern Transvaal, Woodbush, 18.IX.1923, Doidge, E. M. 17793, fallen log (GAM 12851, ISOTYPE of ***Penzigia verrucosa***).

The part of type material at GAM is sterile. It contains stromata of a penzigioid ***Xylaria*** belonging to the ***X. polymorpha*** complex.

verrucosum (***Hypoxylon***) Theiss., Ann. Mycol. 7: 141. 1909.

≡ ***Hypoxylina verrucosa*** (Theiss.) Rick, Archiv. Mus. Nac. Rio de Janeiro 36: 71. 1934.

We have not seen material of this fungus.

versipellis (***Sphaeria***) Tode = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

vulgaris (***Ustulina***) Tul. & C. Tul. = * ***Kretzschmaria deusta*** (Hoffm.: Fr.) P. Martin

vulgaris (***Ustulina***) Tul. & C. Tul. *f.* ***conidiophora*** Bres. *apud* E. J. Durand & De Wild., Fl. Bas- et Moyen-Congo, III, fasc. 3, p. 328. 1912.

≡ ***Hypoxylon deustum*** (Hoffm.: Fr.) Grev. *f.* ***conidiophorum*** (Bres.) Hendrickx, Publ. Inst. Natl. Étude Agron. Congo Belge, sér. Sci., 35: 7. 1948.

This is an incorrect name because it is based on the anamorph of a ustulinoid ***Kretzschmaria***.

vulgaris (***Ustulina***) Tul. & C. Tul. *f.* ***madagascariensis*** Henn. ≡ ***Hypoxylon deustum*** (Hoffm.: Fr.) Grev. *f.* ***madagascariensis*** (Henn.) Hendrickx = ? ***Kretzschmaria zonata*** (Lév.) Sacc.

warburgii (***Daldinia***) Henn., Hedwigia 32: 225. 1893.

INDONESIA: Celebes, Warburg, wood (S, LECTOTYPE [selected by Ju and Rogers (1996)] of ***Daldinia warburgii***).

It is an undoubted ***Kretzschmaria*** species. Child (1932), however, believed that this is a ***Hypoxylon***. The material is fragmentary and further identification is thus impossible.

xylarioides (***Kretzschmaria***) (Speg.) Sacc., Syll. Fung. II, p. xxix. 1883.
≡ ***Hypoxylon xylarioides*** Speg., Anales Soc. Ci. Argent. 9: 179. 1880.
≡ ***Rhopalopsis xylarioides*** (Speg.) Cooke, Grevillea 11: 94. 1883.
This was listed as a synonym of ***Xylosphaera apiculata*** (Cooke) Dennis [≡ ***Xylaria apiculata*** Cooke] by Dennis (1958).

* ***zelandica*** J. D. Rogers & Y.-M. Ju

* ***zonata*** (***Kretzschmaria***) (Lév.) P. Martin ≡ ***Sphaeria zonata*** Lév. ≡ ***Ustulina zonata*** (Lév.) Sacc.

ACKNOWLEDGMENTS

PPNS No. 0274, Department of Plant Pathology, Project 1767, Washington State University, College of Agriculture and Home Economics, Pullman, WA. This study was supported in part by National Science Foundation grant DEB-9500503 to JDR. We thank the curators of cited herbaria for loaning specimens and searching for material. We thank our colleague, Felipe San Martín, Victoria, Mexico for field collections. We thank Donald P. Rogers, Auburn, WA, for checking Latin diagnoses. We thank Michael J. Adams, Washington State University, for photographing fungal specimens. We thank D. A. Glawe, Washington State University-Puyallup, and Richard T. Hanlin, University of Georgia, for reading the manuscript.

LITERATURE CITED

Campell, W. A., and R. W. Davidson. 1940. ***Ustulina vulgaris*** decay in sugar maple and other hardwoods. J. Forestry 38: 474-477.

Cannon, P. F., D. L. Hawksworth, and M. A. Sherwood-Pike. 1985. The British Ascomycotina. An annotated checklist. Commonw. Mycol. Inst., Slough, UK. 302 p.

Cartwright, K. S. G., and W. P. K. Findlay. 1950. Decay of timber and its prevention. Chemical Publ. Co., Brooklyn, New York. 294 p.

Child, M. 1932. The genus ***Daldinia***. Ann. Missouri Bot. Gard. 19: 429-496.

Cooke, M. C. 1883. ***Nummularia*** and its allies. Grevillea 12: 1-9.

Dennis, R. W. G. 1956. Some Xylarias of tropical America. Kew Bull. 1956: 401-444.

Dennis, R. W. G. 1957. Further notes on tropical American Xylariaceae. Kew Bull. 1957: 297-332.

Dennis, R. W. G. 1958. Some Xylosphaeras of tropical Africa. Revista Biol., Lisboa 1: 175-208.

Dennis, R. W. G. 1961. Xylarioideae and Thamnomycetoideae of Congo. Bull. Jard. Bot. État 31: 109-154.

Dennis, R. W. G. 1963. Hypoxyloideae of Congo. Bull. Jard. Bot. État 33: 317-343.

Dennis, R. W. G. 1970. Fungus flora of Venezuela and adjacent countries. Kew Bull., add. Ser., 3: 1-531.

Ellis, J. B., and B. M. Everhart. 1896. New species of tropical fungi. Bull. Lab. Nat. Hist. Iowa State Univ. 4: 67-72.

Farr, D. F., G. F. Bills, G. P. Chamuris, and A. Y. Rossman. 1989. Fungi on plants and plant products in the United States. APS Press, St. Paul, Minnesota. 1252 p.

Fries, E. M. 1823. Systema mycologicum. II. Lundae. 620 p.

Fries, E. M. 1832. Systema mycologicum. Index. Gryphiswaldae. 202 p.

Fries, E. M. 1849. Summa vegetabilium Scandinaviae. II. Holmiae & Lipsiae. 572 p.

Hepting, G. H. 1971. Diseases of forest and shade trees of the United States. U.S. Dept. Agric., Agric. Handb. 386. 658 p.

Jong, S.-C., and J. D. Rogers. 1972. Illustrations and descriptions of conidial states of some ***Hypoxylon*** species. Wash. State Agric. Exp. Sta. Bull. 71. 51 p.

Ju, Y.-M., and J. D. Rogers. 1996. A revision of the genus ***Hypoxylon***. APS Press, St. Paul, Minnesota. 382 p.

Ko, W. H., W. C. Ho, and R. K. Kunimoto. 1982. Relation of ***Kretzschmaria clavus*** to hypoxyloid stromata on diseased macadamia tissues. Phytopathology 72: 1357-1358.

Ko, W. H., R. K. Kunimoto, and I. Maedo. 1977. Root decay caused by ***Kretzschmaria clavus***: its relation to macadamia decline. Phytopathology 67: 18-21.

Ko, W. H., J. Tomita, and R. L. Short. 1986. Two natural hosts of ***Kretzschmaria clavus*** in Hawaiian forests. Plant Pathology 35: 254-255.

Laessøe, T. 1994. Index Ascomycetum 1. Xylariaceae. Systema Ascomycetum 13: 43-112.

Lloyd, C. G. 1921. Mycological notes no. 65. Additional notes on ***Kretzschmaria***. Mycol. Writings 6: 1033-1034.

Martin, P. 1970. Studies in the Xylariaceae: VIII. ***Xylaria*** and its allies. J. S. African Bot. 36: 71-83.

Miller, J. H. 1928. Biologic studies in the Sphaeriales. II. Mycologia 20: 205-339.

Miller, J. H. 1961. A monograph of the world species of ***Hypoxylon***. Univ. Georgia Press, Athens. 158 p.

Nannfeldt, J. A. 1972. ***Camarops*** Karst. (Sphaeriales, Boliniaceae) with special regard to its European species. Svensk Bot. Tidskr. 66: 335-376.

Nilsson, T., G. Daniel, T. K. Kirk, and J. R. Obst. 1989. Chemistry and microscopy of wood decay by some higher Ascomycetes. Holzforschung 43: 11-18.

Persoon, C. H. 1796. Observationes mycologicae. I. Lipsiae. 115 p. + 6 plates.

Persoon, C. H. 1801. Synopsis methodica fungorum. Gottingae. 706 p.

Petch, T. 1912. Revisions of Ceylon fungi. Part III. Ann. Roy. Bot. Gard. (Peradeniya) 5: 286. (Summarized by Wilkins, 1933).

Petch, T. 1923. The diseases of the tea bush. Macmillan and Co., Ltd., London. 220 p.

Petch, T. 1924. Xylariaceae Zeylanicae. Ann. Roy. Bot. Gard. (Peradeniya) 8: 119-166.

Petch, T. 1928. Tropical root disease fungi. Trans. Brit. Mycol. Soc. 13: 238-253.

Petrini, L. E., and E. Müller. 1986. Haupt- und nebenfruchtformen europäischer ***Hypoxylon***- Arten (Xylariaceae, Sphaeriales) und verwandter pilze. Mycologia Helv. 1: 501-627.

Pouzar, Z. 1985a. Reassessment of ***Hypoxylon serpens*** - complex I. Česká Mykol. 39: 15-25.

Pouzar, Z. 1985b. Reassessment of the ***Hypoxylon serpens*** - complex II. Česká Mykol. 39: 129-134.

Rick, J. 1934. Monographia das Xylariaceas Riograndenses. Archiv. Mus. Nac. Rio de Janeiro 36: 41-71.

Roger, L. 1953. Phytopathologie des Pays Chauds. Tome 2. Encyclopédie Mycologique 18. Paul Lechevalier, Paris. p. 1129–2256.

Rogers, J. D. 1968. ***Hypoxylon deustum***: the chromosome number. Mycopath. Mycol. Applicata 35: 249-255.

Rogers, J. D. 1979. The Xylariaceae: systematic, biological and evolutionary aspects. Mycologia 71: 1-42.

Rogers, J. D., B. E. Callan, and G. J. Samuels. 1987. The Xylariaceae of the rain forests of North Sulawesi (Indonesia). Mycotaxon 29: 113-172.

Rogers, J. D., and F. Candoussau. 1980. A new variety of ***Hypoxylon cohaerens*** from France. Mycologia 72: 826-829.

Rogers, J. D., and Y.-M. Ju. 1997. The genus ***Stilbohypoxylon***. Mycol. Res. 101: 135-138.

Rogers, J. D., Y.-M. Ju, and D. E. Hemmes. 1992. ***Hypoxylon rectangulosporum*** *sp. nov.*, ***Xylaria psidii*** *sp. nov.*, and comments on taxa of ***Podosordaria*** and ***Stromatoneurospora***. Mycologia 84: 166-172.

Saccardo, P. A. 1882. Sylloge fungorum omnium hucusque cognitorum. I. Patavii (Typis Seminarii). 768 p.

Saccardo, P. A. 1902. Sylloge fungorum omnium hucusque cognitorum. XVI. Patavii (Typis Seminarii). 1291 p.

Saccardo, P. A. 1928. Sylloge fungorum omnium hucusque cognitorum. XXIV, sect. II. Abellini (Typis Pergola). p. 705-1438.

Spegazzini, C. 1881. Fungi Argentini additis nonnullis Brasiliensibus Montevideensibusque. Pugillus IV. Anales Soc. Ci. Argent. 12: 97-117.

San Martín González, F., and J. D. Rogers. 1993. ***Kretzschmaria***, ***Leprieuria***, and ***Poronia*** in Mexico. Mycotaxon 48: 179-191.

Schwarze, F. W. M. R., D. Lonsdale, and C. Mattheck. 1995. Detectability of wood decay caused by ***Ustulina deusta*** in comparison with other tree-decay fungi. Eur. J. For. Path. 25: 327-341.

Tulasne, L. R., and C. Tulasne. 1863. Selecta carpologia fungorum. II. (English translation of W. B. Grove). Oxford Univ. Press. 319 p. + illus.

Van der Gucht, K. 1994. The Xylariaceae of Papua New Guinea. Ph.D. dissertation. Unversiteit Gent, Belgium. 359 p. + 142 plates.

Van Overeem, C. 1924. Ueber ***Ustulina vulgaris*** Tul. und ***U. zonata*** (Lév.) Sacc. Bull. Jard. Bot. Buitenzorg, sér. III, 6: 256-263.

Weir, J. R. 1927. The problem of ***Dichrostachys nutans***, a weed tree in Cuba with remarks on its pathology. Phytopathology 17: 137-146.

Wilkins, W. H. 1933. Studies in the genus ***Ustulina*** with special reference to parasitism. I. Introduction, survey of previous literature, and host index. Trans. Brit. Mycol. Soc. 18: 320-346.

Wilkins, W. H. 1935. Studies in the genus ***Ustulina*** with special reference to parasitism. II. A disease of the common lime (***Tilia vulgaris*** Hayne) caused by ***Ustulina***. Trans. Brit. Mycol. Soc. 20: 133-156.

Wilkins, W. H. 1938. Studies in the genus ***Ustulina*** with special reference to parasitism. III. Spores—germination and infection. Trans. Brit. Mycol. Soc. 22: 47-93.

Wilkins, W. H. 1939a. Studies in the genus ***Ustulina*** with special reference to parasitism. IV. Conidia—germination and infection. Trans. Brit. Mycol. Soc. 23: 65-85.

Wilkins, W. H. 1939b. Studies in the genus ***Ustulina*** with special reference to parasitism. V. A disease of elm (***Ulmus campetris*** Sm.) caused by ***Ustulina***. Trans. Brit. Mycol. Soc. 23: 171-185.

FIGURE LEGENDS

Figs. 1-13. Ascus tips and ascospores of ***Kretzschmaria*** and ***Xylaria*** species. 1. ***Kretzschmaria clavus*** (G. J. Samuels 5749 from French Guiana; NY). 2. ***K. zelandica*** (holotype). 3. ***K. cetrarioides*** (A. M. Farr 119 from Brazil; NY). 4. ***K. guyanensis*** (holotype). 5. ***K. megalospora*** (holotype). 6. ***K. deusta*** (Petrak's Mycoth. General. no. 1886; WSP 19263). 7. ***K. zonata*** (Y.-M. Ju 77082304 from Taiwan; JDR). 8. ***K. sandvicensis*** (J. D. Rogers from Hawaii, U.S.A.; JDR). 9. ***K. pavimentosa*** (Y.-M. Ju 80091412 from Taiwan; JDR). 10. ***K. eriodendri*** (lectotype). 11. ***K. curvirima*** (holotype). 12. ***Xylaria heliscus*** (lectotype of ***Rhopalopsis berkeleyanum***). 13. ***X. apoda*** (T. Petch 5204 from Sri Lanka; K). The scale bar A which represents 20 μm is applied to Figs. 1-11. The scale bar B which represents 10 μm is applied to Figs. 12 and 13.

Figs. 14-24. ***Kretzschmaria clavus***, ***K. zelandica***, ***K. cetrarioides***, ***K. micropus***, and ***K. curvirima***. 14. ***K. clavus*** (G. J. Samuels 5749 from French Guiana; NY). Stromata; X3. 15, 16. ***K. zelandica*** (holotype). 15. Stromata; X1. 16. Stroma; X8. 17, 18. ***K. cetrarioides*** (A. M. Farr 119 from Brazil; NY). 17. Stromata; X1.25. 18. Stromata bearing umboes or conical processes (arrowheads); X4.5. 19, 20. ***K. micropus*** (isolectotype of ***K. spinifera***; GZU 2093). 19. Stromata; X6. 20. Stromatal surface with sharply conical ostiolar openings and conical or spine-like processes (arrowheads); X16. 21-24. ***K. curvirima*** (holotype). 21. Stromata (top view); X3. 22. Stromata (lateral view); X5. 23. Stromata (underside) with narrow connectives; X6. 24. Vertical section of densely aggregated stromata, each containing one perithecium; X5.

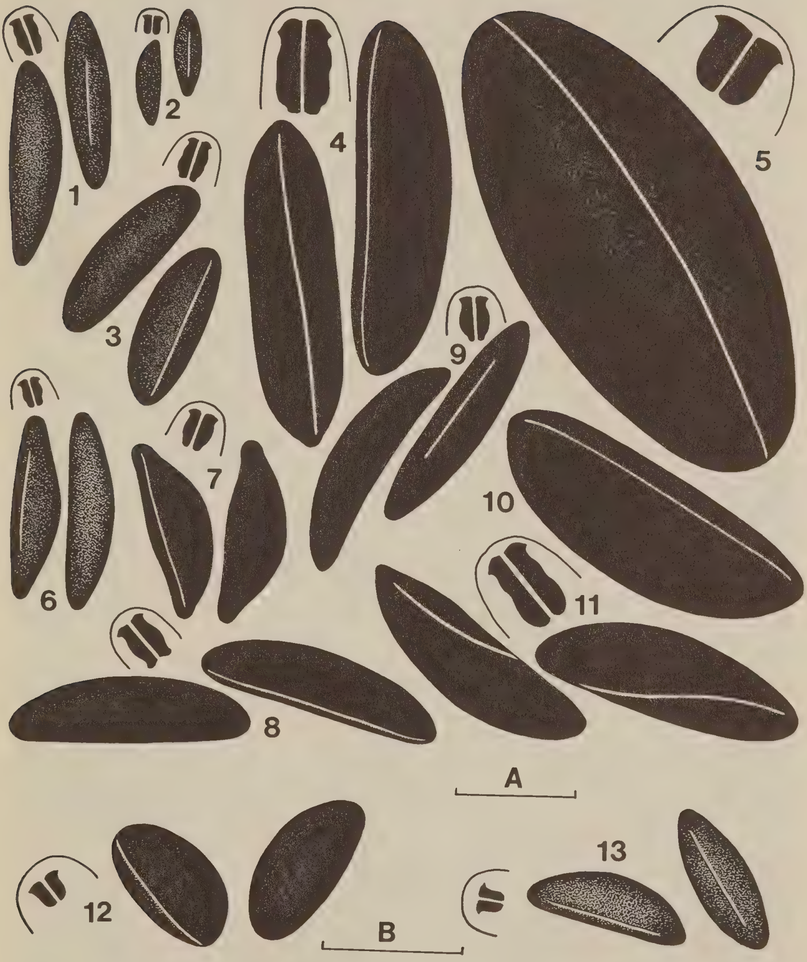
Figs. 25-35. ***Kretzschmaria guyanensis***, ***K. megalospora***, and ***K. macrosperma***. 25-28. ***K. guyanensis*** (holotype). 25. Stromata; X1. 26. Stromatal surface with coarsely papillate ostiolar openings and conical processes (arrowheads); X6. 27. Vertical section of a stroma showing several immersed perithecia and conical processes (arrowheads); X6. 28. Stroma (underside) with a narrow connective; X6. 29-31. ***K. megalospora*** (holotype). 29. Stroma; X4. 30. Stroma (underside) with a narrow connective; X2. 31. Stromatal surface with obtusely conical ostiolar openings and exuded ascospore masses (arrowheads); X16. 32-35. ***K. macrosperma*** (32, 33 from neotype; 34, 35 from GZU-Petrak 1188, isotype of ***Hypoxylon nucele***). 32. Stromata; X2.66. 33. Vertical section of a stroma containing a single perithecium; X3. 34. Three aggregated stromata; X1. 35. Stromata, the stroma on the right showing polygonal scales on the surface and the stroma on the left, cut vertically, showing multiple perithecia; X16.

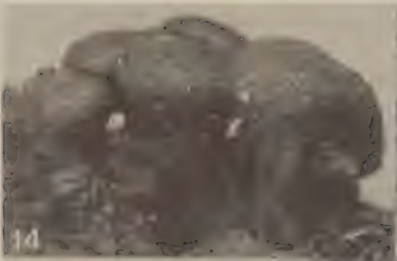
Figs. 36-47. ***Kretzschmaria lucidula***, ***K. pavimentosa***, ***K. deusta***, ***K. milleri***, and ***K. neocaledonica***. 36, 37. ***K. lucidula*** (G. J. Samuels et al. 5743 from French Guiana; NY). 36. Stromata; X2.66. 37. Stromata with cracks on the top and vertical striations on the sides; X10. 38-40. ***K. pavimentosa*** (lectotype). 38. Stroma; X5.5. 39. Stromata showing conspicuous crenate steep margins; X10. 40. Stromatal surface with papillate ostiolar openings; X16. 41, 42. ***K. deusta*** (Petrak's Mycoth. General. no. 1886; WSP 19263). 41. Stroma; X2.33. 42. Stromatal surface with coarsely papillate ostiolar openings; X16. 43-45. ***K. milleri*** (holotype). 43. Stromata; X2. 44. Stromata (underside) showing narrow connectives; X2. 45. Stromatal surface with coarsely papillate ostiolar openings; X16. 46, 47. ***K. neocaledonica*** (Y.-M. Ju 73072702 from Taiwan; JDR). 46. Stromata; X1.75. 47. Stromata with a short stipe or narrow connective and conspicuous conical ostiolar openings; X3.

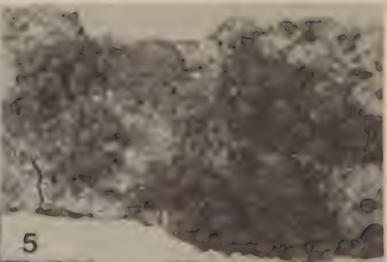
Fig. 48. ***Kretzschmaria zonata*** (Y.-M. Ju 77082304 from Taiwan; JDR). Conidiophores and conidia. The scale bar represents 10 μm.

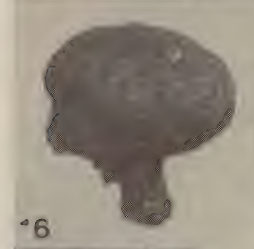
Fig. 49. ***Xylaria apoda*** (Y.-M. Ju 76072305 from Taiwan; JDR). Conidiophores and conidia. The scale bar represents 10 μm.

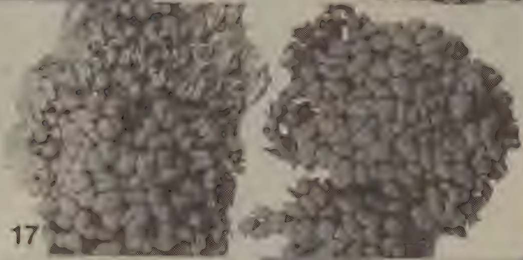
Fig. 50. ***Xylaria intracolorata*** (Y.-M. Ju 76082225 from Taiwan; JDR). Conidiophores and conidia. The scale bar represents 10 μm.

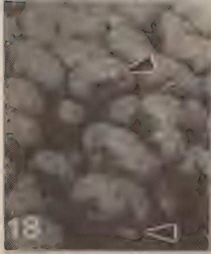

A
B

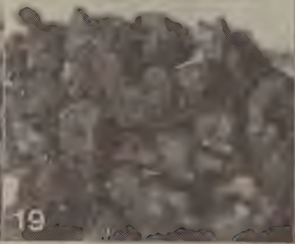

14

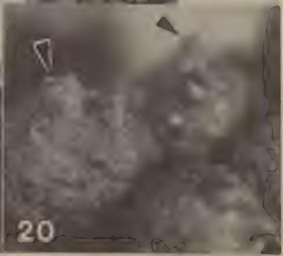

5

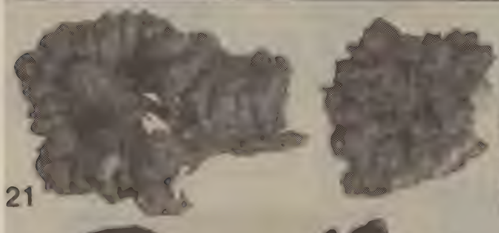

16

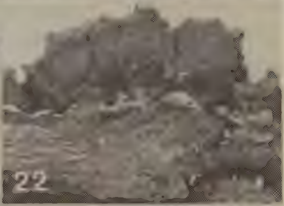

17

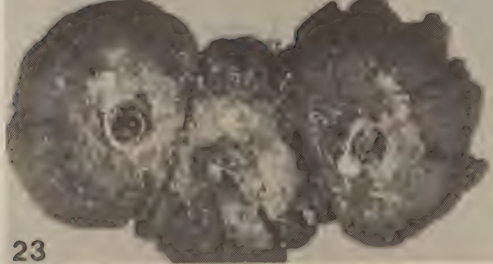

18

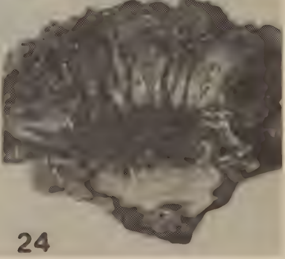

19


20

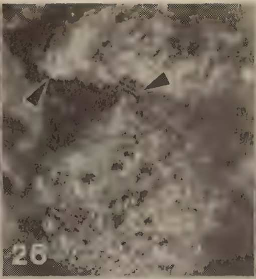

21

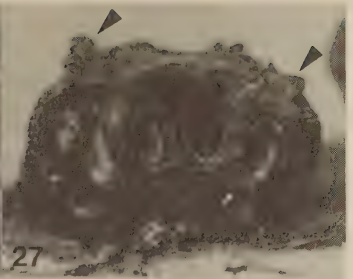

22

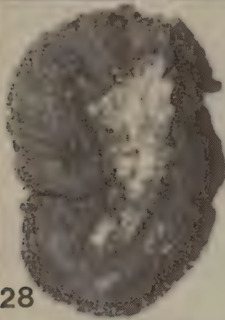

23

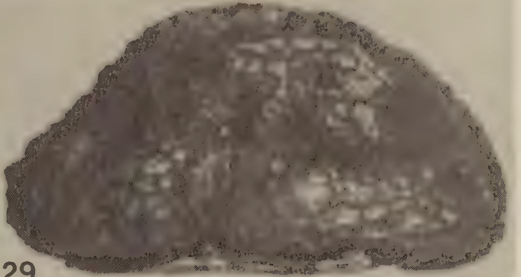

24

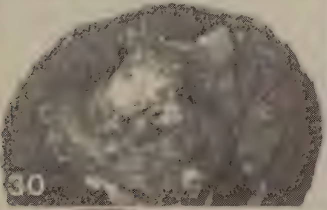
25

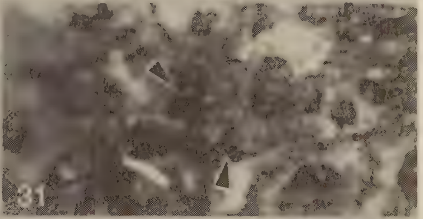

26

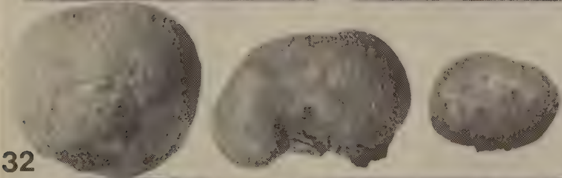

27

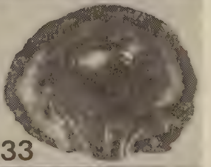

28

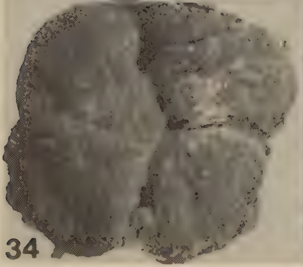

29

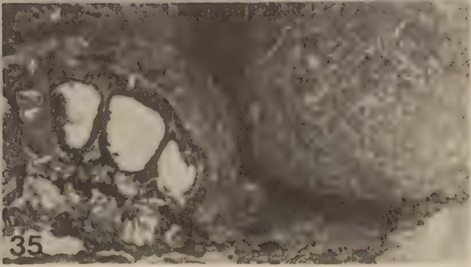

30

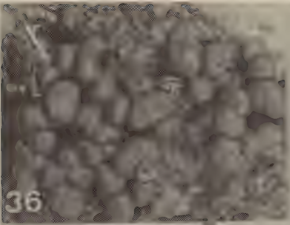

31

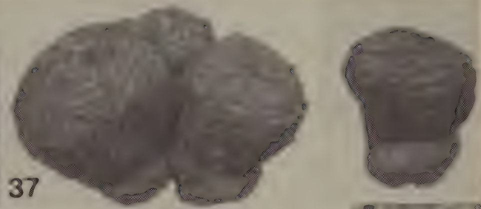

32

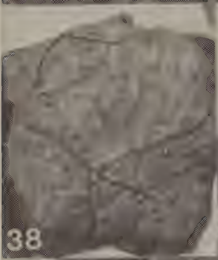

33

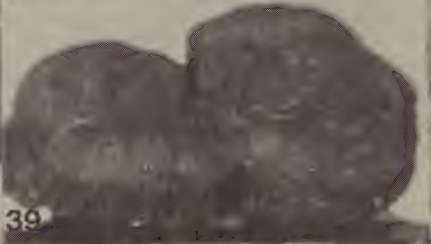

34

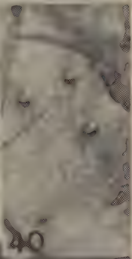

35

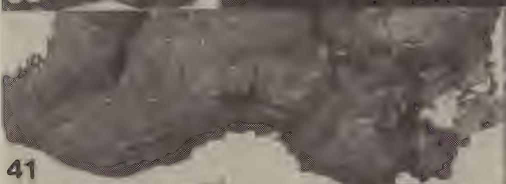

36

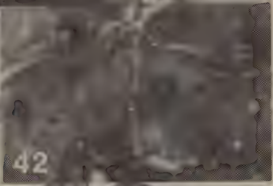

37

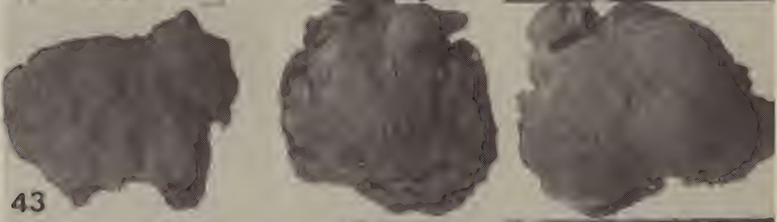

38

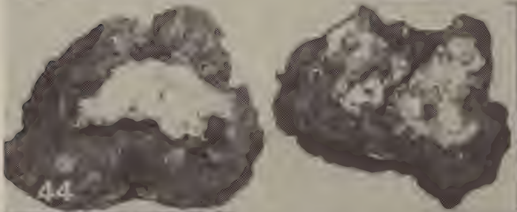

39

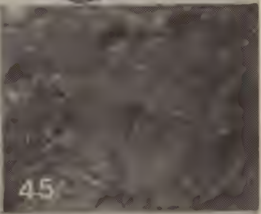

40

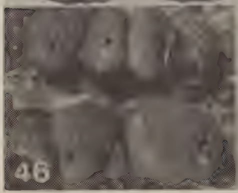

41

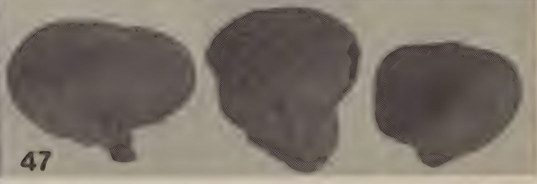

42

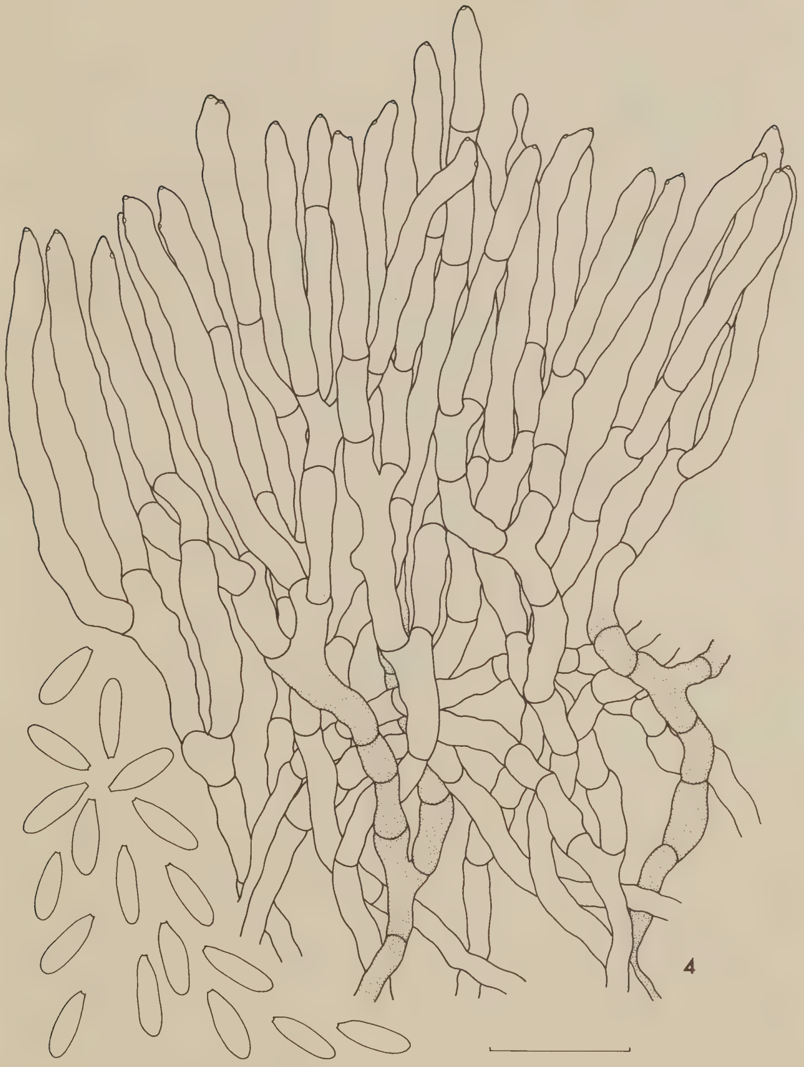

43


44

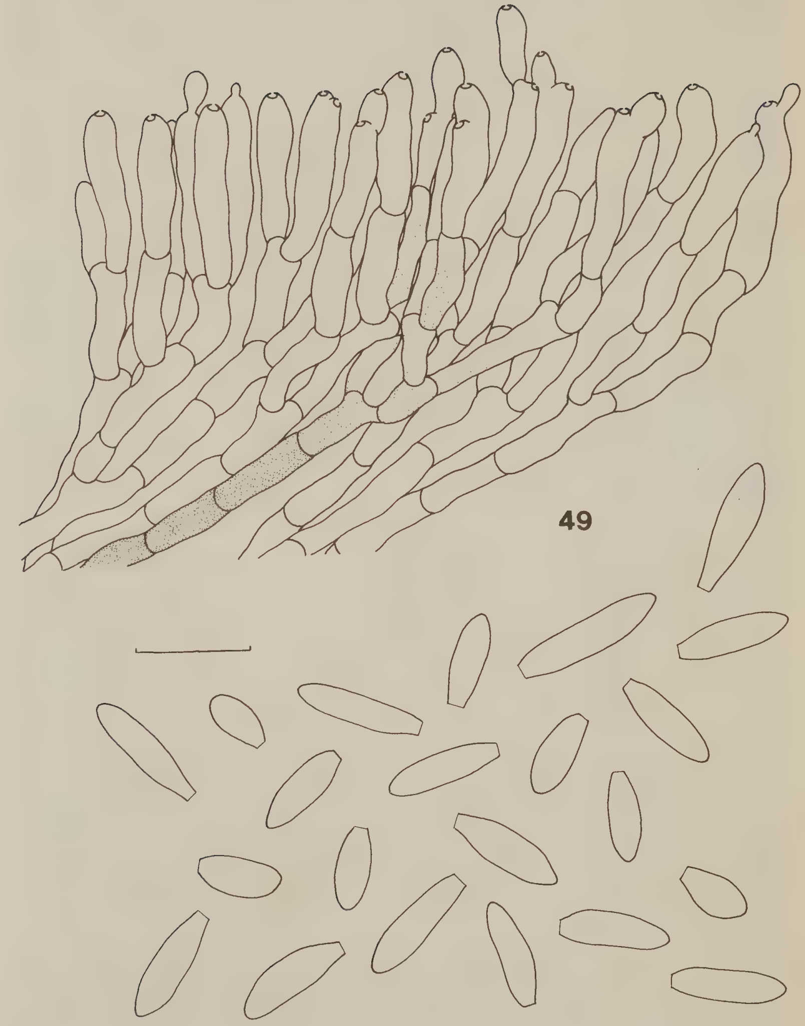

45


46

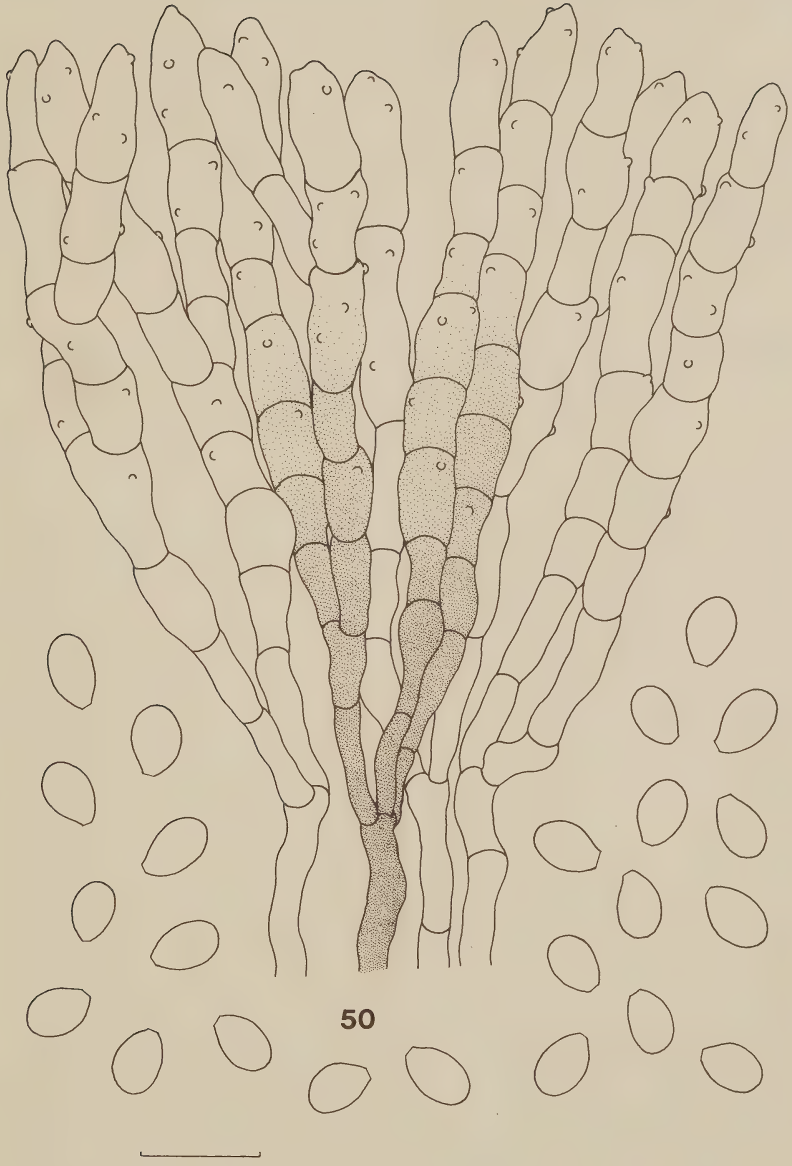

47



4



49



50

MYCOTAXON

Volume LXVIII, pp. 395-403 July-September 1998

PYRENOMYCETES OF BRITISH COLUMBIA COLLECTED BY JOHN MACOUN

MARGARET E. BARR

9475 Inverness Road, Sidney, British Columbia, Canada
V8L 5G8

SUMMARY

Notes are presented on some interesting collections made by John Macoun in British Columbia during the late nineteenth and early twentieth centuries. Two new species, *Leptosphaeria macounii* and *L. macrosporoides* are described from the material.

John Macoun (1831-1920) was an explorer and naturalist and a remarkable man. His autobiography (Macoun 1979) that sets forth details of his exploring and collecting trips makes fascinating reading. Although he had no formal training, he worked as botanist with the Geological and Natural History Survey of Canada from 1882 to 1912. He collected energetically and enthusiastically flowering plants, mosses, lichens and other fungi, in many regions across the country. The fungi were sent to mycologists such as C.H. Peck, E.A. Burt and others. Pyrenomycetes went to J.B. Ellis in Newfield, New Jersey, who identified these and with B.M. Everhart described several as new species. Most of the specimens that Ellis studied are now deposited in NY or FH, with parts in DAOM. The first report of pyrenomycetes from British Columbia included one new species and records of described taxa (Ellis and Everhart 1887). A second listing (Ellis and Everhart 1890), from Macoun's 1889 collecting journey, added three new names and additional records. In the monumental "North American Pyrenomycetes," Ellis and Everhart (1892) included still other records of British Columbian Pyrenomycetes. They described (1893, 1898) two additional species from British Columbia as new.

When Macoun retired in 1912 he moved to Sidney on Vancouver Island, British Columbia. In spite of a stroke that made writing difficult and required that he use a cane for assistance in walking, he made many collections of fungi, mainly during 1914, 1915, and 1916. John Dearness studied and named many of the specimens (Ginns 1986). Dearness described several new species of pyrenomycetes from the collections and had manuscript names for some others. These collections are deposited in DAOM. I was privileged to study the pyrenomycete collections recently. Previously isotypes and other collections of historical value were investigated when I was a graduate student at the University of British Columbia. Those species were included in a listing of pyrenomycetes identified from British Columbia (Barr 1953).

As most nonmycologists do, Macoun collected at first the more conspicuous pyrenomycetous fungi, such as xylariaceous, diatrypaceous, hypocreaceous and some diaporthaceous species. His later collections included more of the smaller and less visible species in both Hymenoascomycetes and Loculoascomycetes.

Two listings of taxa follow. The first offers a chronological list of the species of British Columbian pyrenomycetes described as new by Ellis and Everhart or by Dearness, based on Macoun's collections. Notes on their present disposition or other noteworthy features are appended.

Lophiostoma (Lophiotrema) aequivocum Ellis & Everh. J. Mycol. 3: 118. 1887. Probable synonym of *Melanomma sanguinarium* (Karst.) Sacc. (Berlese 1891); not lophiostomataceous (Chesters and Bell 1970). The isotype collection in DAOM (on wood, Comox, British Columbia, 3 May 1887, J. Macoun) bears widely erumpent, gregarious, medium-sized ascomata with small rounded or compressed papillae. Ascospores measure 15-22.5 x 4.5-6 µm, not 12-14 x 3-3.5 µm as given in the description. They are three septate, at times bear short terminal appendages, and lie partially biseriate in the asci. Thus fungus could indeed be a specimen of *Melanomma sanguinarium*, although reddened hyphae or apical tissues were not seen.

Diatrype macounii Ellis & Everh. Proc. Acad. Nat. Sci. Philadelphia 42: 224. 1890. A synonym of *D. bullata* (Hoffm.: Fr.) Fr. (Glawe and Rogers 1984; Rappaz 1987). A common species on *Salix*.

Diaporthe columbiensis Ellis & Everh. Proc. Acad. Nat. Sci. Philadelphia 42: 233. 1890. A large-spored species similar to *D. binoculata* (Ellis) Sacc. (Wehmeyer 1933); in section *Latispora* M.E. Barr. Host given as dead aspen (*Populus tremuloides* Michx.) on isotype (DAOM, Hastings, British Columbia, 11 Apr 1889, J. Macoun 32); but perhaps as *Rosa* or *Nuttallia* (= *Oemleria*) by Wehmeyer (1933). Collections on these two host genera and on *Ribes* that were determined by Dearness as this species are not identical to *D. columbiensis*. Despite careful search, I have not yet collected the species locally.

Nectria pithoides Ellis & Everh. Proc. Acad. Nat. Sci. Philadelphia 42: 247. 1890. Either *N. episphaeria* (Tode: Fr.) Fr. or *N. purtonii* (Grev.) Berk. Identification of the precise species is dependent on the anamorph (Samuels et al. 1991).

Melogramma columbiensis Ellis & Everh. Erythea 1: 199. 1893. A synonym of *Dothiora sphaeroides* (Pers.: Fr.) Fr. (Laflamme 1975).

Coprolepa gigaspora Ellis & Everh. Bull. Torrey Bot. Club 25: 501. 1898. *Hypocopra gigaspora* (Ellis & Everh.) Griffiths; doubtfully separate from *H. amphisphaerioides* (Ellis & Everh.) Griffiths, but Cain (1934) suggested that all North American appendiculate species of *Hypocopra* could be referred to *Coprolepa saccardoi* Oudem.

Trichosphaeria breviseta Dearn. Mycologia 8: 99. 1916. A species closely allied to *T. pilosa* Fuckel (Barr pers. comm.).

Diaporthe macounii Dearn. Mycologia 8: 100. 1916. Transferred as *Cryptodiaporthe macounii* (Dearn.) Wehm. (Wehmeyer 1933).

Metasphaeria macounii Dearn. Mycologia 8: 100. 1916. A synonym of *Melomastia mastoidea* (Fr.) Schröt. (Barr 1994). This is a common saprotroph locally in various woody stems.

Diaporthe exiguestroma Dearn. Mycologia 9: 348. 1917. A species of *Didymella* (Wehmeyer 1933); synonym of *Massarina microspora* (Fuckel) Sacc. (Barr pers. comm.).

Protoventuria vancouverensis Dearn. Mycologia 9: 348. 1917. Accepted species (Barr 1971), which was redescribed and transferred earlier as *Antennularia vancouverensis* (Dearn.) M.E. Barr (Barr 1968).

Leptosphaeria gaultheriae Dearn. Mycologia 9: 349. 1917. A synonym of *Melanomma rhododendri* Rehm (species redescribed by Holm 1968, this synonym added by Barr 1990).

The second list includes information on certain of Macoun's collections that are unique in some way, or that were recognized by Dearness as undescribed and are here given names and described.

Amphisphaeria vibratilis (Fuckel) E. Mull. Two collections on *Prunus emarginata* (Dougl.) Walp., Comox, Jun 1915, are fine examples of the species. They provide the first record from North America. The fungus fits well the description by Müller (in Müller and Arx 1962); the species is similar in structure to *A. multipunctata*

(Fuckel) Petr., but larger in all respects. Several recent collections on dead stems of *Rosa* that were originally determined as a large form of *A. multipunctata* are identical (M.E. Barr 8407, 8671, 9104, DAOM).

Diaporthe lokoyae Funk. Two collections on conifers, 5 Oct 1914 and 3 Apr 1915 are early examples of the species described from *Pseudotsuga menziesii* (Mirb.) Franco by Funk (1968).

Hypomyces lactifluorum (Schwein.: Fr.) Tul. is represented by a collection given the unpublished name *Hypomyces columbiensis*, 6 Sep 1916, J. Macoun. The host fungus was said to be *Pleurotus*, but laticiferous hyphae and stature indicate it is a species of *Lactarius*. Apparently this is the earliest record from British Columbia; the province was not cited in the listing of collections examined by Rogerson and Samuels (1994).

Hypoxylon novemexicanum J.H. Mill. A specimen, on poplar, Saanichton, 24 Mar 1915, determined as *Hypoxylon perforatum* (Schwein.: Fr.) Fr. evidently is an early collection of this species. The large ascospores and other aspects of the fungus agree with the description of Ju and Rogers (1996). A second British Columbian collection is listed by Ju and Rogers as well as two New Mexican specimens.

Leiosphaerella moravica (Petr.) Petr. Sydowia 15: 209. 1961(1962). Fig.1 a-c

Ascomata immersed, separate or gregarious, visible through thin periderm as rounded, depressed, black apex, sphaeroid, 150-300 µm wide, 100-200 µm high; ostiole minute, periphysate; peridium 20 µm wide in upper regions, forming a thin, closely adhering, blackened clypeus, narrower toward base to 10 µm, of compressed rows of cells. Asci 35-90 x 5-7 µm, unitunicate, basal, short stipitate; apical ring narrow, refractive, amyloid. Paraphyses sparse, narrow, in gel matrix. Ascospores 13-20 x 2-3 µm, hyaline, narrowly oblong or fusoid, apex obtuse, tapered to more acute base, 1-septate, median or slightly submedian; wall thin; guttulate; overlapping biseriate in the ascus.

On wild rose stems, Sidney, British Columbia, 9 Mar 1915, two packets 22 Apr 1915, J. Macoun 375, DAOM.

Dearness had labelled the three packets with the herbarium name '*Mycosphaerella rosaeicola*, may be n.s.' (non *Mycosphaerella rosicola* B.H. Davis 1938). *Saccothecium sepincola* (Fr.: Fr.) Fr. is also present on the stems, just as Petrak (1914) had noted the association in his description. Both fungi are similar in size and aspect under the dissecting microscope. A third species on the same host plant, *Pseudomassaria sepincolaeformis* (De Not.) Arx, could also be confused, as the specific

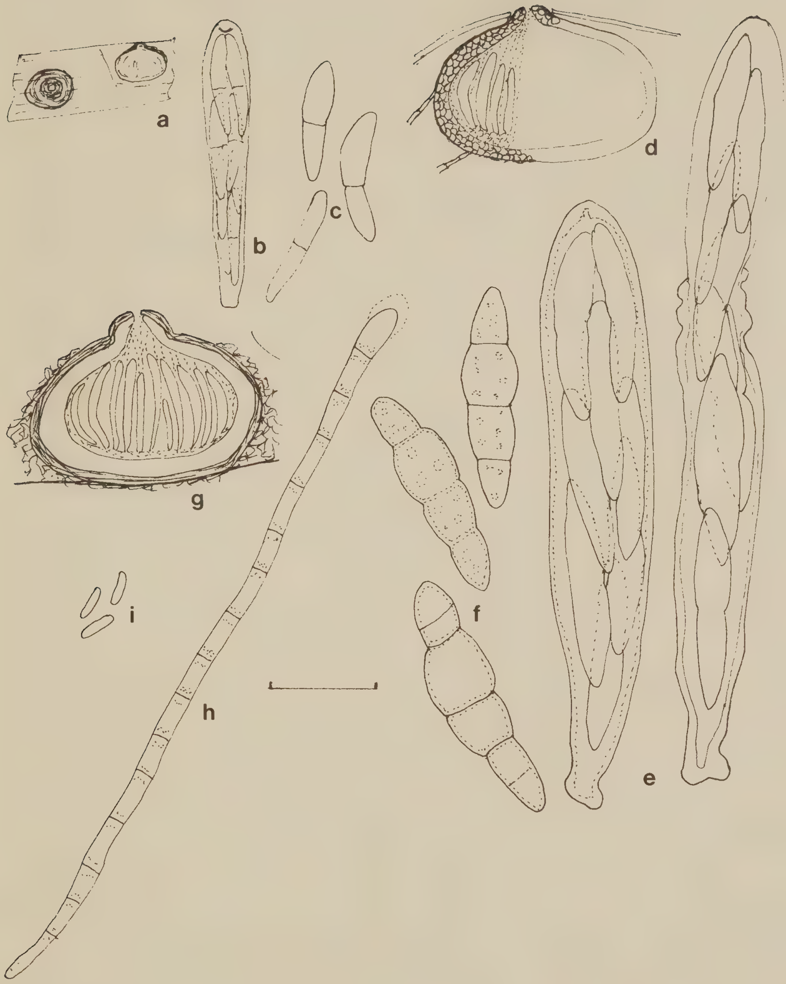


Fig. 1. Some Macoun Pyrenomycetes. a-c. *Leiosphaerella moravica*: a. habit of ascomata, b. ascus, c. ascospores. d-f. *Leptosphaeria macrosporoides*: d. ascoma in vertical section. e. asci, the right hand one showing fissitunicate dehiscence. f. ascospores. g-i. *Leptosphaeria macounii:* g. ascoma in vertical section. h. ascospore. i. conidia from associated anamorph. Standard line = 15 µm for ascus and ascospore figures, 150 µm for ascoma figures. Habit not to scale.

epithet indicates. These three taxa are readily separated by microscopic features of asci and ascospores.

The collections of *Leiosphaerella moravica* have smaller ascospores than those of the temperate-zone species *L. praeclara* (Rehm) Höhn., the type of the genus, which measure 30-40 x 3-5 µm, or *L. falcata* M.E. Barr which measure 46-86(-90) x 3-5(-7) µm.

Leptosphaeria macounii M.E. Barr, sp. nov. Fig.1 g-i

Ascomata immersa sphaeroidea 380-450 µm lata 250-350(-500) µm alta, papillata vel rostrata. Asci (100-) 125-135 x 7-10 µm bitunicati basali. Pseudoparaphyses cellulosae 2-3 µm latae. Ascosporae 70-100 x 1.5-3 µm hyalinae vel fuscescentae 7-15 septatae fasciculatae. Holotypus in caulibus *Castillejae* sp. "British Columbia: Sidney, 14 May 1995," a M.E. Barr 8969 lectus in DAOM depositus. Paratypus in ramulibus *Spiraeae douglasii* Hook., (sub *Spiraea menziesii* Hook.) "British Columbia: Sidney, May 1915," a J. Macoun 371-3 lectus in DAOM depositus.

Ascomata immersed erumpent, separate to gregarious, sphaeroid, 380-450 µm wide, 250-350(-500) µm high; apex short papillate to short beaked; peridium externally strongly darkened, ca. 25 µm, bearing reddish brown hyphae, lightly pigmented internally, ca. 25-50 µm, of firm-walled but not scleroparenchymatous cells. Asci (100-)125-135 x 7-10 µm, bitunicate, basal. Pseudoparaphyses narrowly cellular, 2-3 µm. Ascospores 70-100 x 1.5-3 µm, hyaline to light yellowish brown, 7-15-septate, widest above and tapered evenly to base; wall smooth; guttulate; fasciculate in the ascus.

In the holotype an anamorph is intimately associated. The conidiomata are similar in peridium structure to the ascomata. Numerous phialides line the locule and form hyaline, rodlike conidia, 10-12 x 1 µm.

The Macoun collection was annotated as *Ophiobolus gracilis* (Niessl) E. Müll. by R.A. Shoemaker. According to Walker (1980) that setose species is a synonym of *Acanthophiobolus helicosporus* (Rehm) Berl. which is now assigned to the Tubeufiaceae (Barr 1997).

Leptosphaeria macounii does not key in Holm's (1957) key to species of *Leptosphaeria*, nor in Shoemaker's (1984a) key, nor in his (Shoemaker 1976) key to species of *Ophiobolus*. There *O. crassus* Shoem., with much longer ascospores, comes closest. The description of *O. castillejae* Tracy & Earle was consulted because of the similar substrate of the holotype, but has shorter and wider ascospores with a pulvinate basal appendage. *Leptosphaeria compressa* (Rehm) L. Holm lacks the well-developed hyphae of the new species and has wider asci as well as ascospores that are constricted at the primary septum with an enlarged cell above and less enlarged below this septum. *Ophiobolus anguillides* (Cooke in Cooke & Ellis) Sacc. forms an enlarged apical cell that is similar in shape to the head of a snake, as well as an apical gel appendage. The short-beaked ascomata have a stout scleroparenchymatous peridium.

Leptosphaeria macrosporoides M.E. Barr, sp. nov. Fig.1, d-f

Ascomata gregaria sphaeroidea 350-400 µm lata 225-300 µm alta, papillata. Asci 80-120 x 12-16 µm bitunicatae. Pseudoparaphyses cellulosae 2-3 µm latae. Ascosporae 30-36 x 7.5-10 µm flavescens brunneae 3-(4-5-)septatae. Holotypus in ramulis *Rubi parviflori* Nutt., "British Columbia: Sidney, 29 Apr 1991," a M.E. Barr 7542 lectus in DAOM depositus.

Ascomata subepidermal, gregarious, sphaeroid, 350-400 µm wide, 225-300 µm high; apex short papillate; peridium dark brown, of pseudoparenchymatous or partly scleroparenchymatous cells, 20-25 µm wide, hyphae into host tissues. Asci 80-120 x 12-16 µm, bitunicate, fissitunicate. Pseudoparaphyses narrowly cellular, 2-3 µm wide. Ascospores 30-36 x 7.5-10 µm, light yellowish brown, 3-(4-5-)septate, mid cells longer and wider than end cells that contain additional septa when formed; wall smooth; guttulate; overlapping biseriate in the ascus.
Additional specimens examined, all on *Rubus parviflorus*, British Columbia: Sidney, 18 Apr 1915, J. Macoun 474 (DAOM); 5 Jan 1992, M.E. Barr 7930, 11 Feb 1992, M.E. Barr 7968, 2 Apr 1995, M.E. Barr 8929, 29 Mar 1996, M.E. Barr 9160 (all DAOM).

This species would key to *L. macrospora* (Fuckel) Thümen in Holm (1957) or as the synonymous name *L. nitschkei* Rehm ex E. Müll. (Müller 1950), or as *L. macrospora* in Shoemaker (1984a). The ascospores are consistently wider, and the peridium of ascomata is less scleroparenchymatous than in *L. macrospora*. This new species has larger and more fusoid ascospores than any of the species of *Leptosphaeria* or of *Phaeosphaeria* that Huhndorf (1992) redescribed from rosaceous hosts. Dearness had annotated the Macoun collections as *Metasphaeria megalospora* Auersw. & Niessl which is a species in *Nodulosphaeria*, *N. megalospora* (Auersw. & Niessl in Niessl) L. Holm (Holm 1961, Shoemaker 1984b).

Three species in the *Pleospora herbarum* complex are recognizable and are separated by ascospore shapes and sizes as well as the *Stemphylium* anamorphs when they are present (Webster 1969, Simmons 1985).
Pleospora herbarum (Pers.: Fr.) Rabenh. (Macoun 9, 586, 901, 912, 917, 927, 929).
Pleospora tarda Simmons (Macoun 384, 385, 387, 388, 916, 928). Both species are common on various herbaceous stems.
Pleospora triglochinicola J. Webster, on *Triglochin maritima* L., Sidney, 4 Jul 1916 J. Macoun (900 ? label torn away) evidently has not been reported from North

America, although a collection from northern Quebec (R.T. Wilce 117) is in fact this fungus, deposited in NY under the name *P. armeriae* (Corda) Ces. & De Not.

Acknowledgments

I wish to express my appreciation to J. Ginns, who not only facilitated my study of Macoun Pyrenomycetes deposited in DAOM, but also reviewed this manuscript and encouraged its publication. Earlier studies on some of the fungi mentioned were made possible by J.W. Groves at DAOM. S. Huhndorf provided a slide for comparison from the J.B. Ellis collections in NY, and advised on the disposition of *Leptosphaeria macrosporoides*.

Literature Cited

Barr, M.E. 1953. Pyrenomycetes of British Columbia. Canad. J. Bot. 31: 810-830.

_____. 1968. The Venturiaceae in North America. Canad. J. Bot. 46: 799-864.

_____. 1971. *Protoventuria* for venturiaceaeous *Antennularia* species. Canad. J. Bot. 49: 1959-1960.

_____. 1990. Melanommatales (Loculoascomycetes). N. Amer. Flora II: 1-129.

_____. 1994. Notes on the Amphisphaeriaceae and related families. Mycotaxon 51: 191-224.

_____. 1997. Notes on 'dimeriaceous' fungi. Mycotaxon 64: 149-171.

Berlese, A.N. 1891. Icones fungorum (Pyrenomycetes). Vol. 1, fasc. 1: 1-28. Patavia.

Cain, R.F. 1934. Studies of coprophilous Sphaeriales in Ontario. Univ. Toronto Stud. (Biol. Ser.) 38: 1-126.

Chesters, C.G.C. and A. Bell. 1970. Studies in the Lophiostomataceae Sacc. Mycol. Pap. 120: 1-55.

Ellis, J.B. and B.M. Everhart. 1887. Additions to Hypocreaceae. J. Mycol. 3: 113-116.

_____ and _____. 1890. New North American fungi. Proc. Acad. Nat. Sci. Philadelphia 42: 219-249.

_____ and _____. 1892. The North American Pyrenomycetes. A contribution to mycologic botany. Publ. by the authors, Newfield, NJ. 793 p.

_____ and _____. 1893. New west American fungi. Erythea 1: 197-202.

_____ and _____. 1898. New species of fungi from various localities. Bull Torrey Bot. Club 25: 501-514.

Funk, A. 1968. *Diaporthe lokoyae* n.sp., the perfect state of *Phomopsis lokoyae*. Canad. J. Bot. 46: 601-603.

Ginns, J. 1986. The Canadians John Macoun and John Dearness, and their contributions to North American mycology. Mycotaxon 26: 47-53.

Glawe, D.A. and J.D. Rogers. 1984. Diatrypaceae in the Pacific Northwest. Mycotaxon 20: 401-460.

Holm, L. 1957. Études taxonomiques sur les Pleosporacées.

Symb. Bot. Upsal. 14(3): 1-188.

_____. 1961. Taxonomical notes on Ascomycetes IV. Notes on *Nodulosphaeria* Rbh. Svensk Bot. Tidskr. 55: 63-80.

_____. 1968. Taxonomic notes on Ascomycetes VI. On the genus *Gibberidea* Fuck. and some alleged relatives. Svensk Bot. Tidskr. 62: 217-242.

Huhndorf, S.M. 1992. Systematics of *Leptosphaeria* species found on the Rosaceae. Illinois Nat. Hist. Surv. Bull. 34: 479- 534.

Ju, Y.-M. and J.D. Rogers. 1996. A revision of the genus *Hypoxylon*. Mycol. Mem. 20: 1-365.

Laflamme, G. 1975(1976). Les genres *Melogramma* Fries et *Melanamphora* gen. nov., Sphaeriales. Sydowia 28: 237-274.

Macoun, J. 1979. Autobiography of John Macoun, Canadian explorer and naturalist. 1831-1920. 2nd ed. Ottawa Field-Naturalists' Club, Ottawa, Ont. 361 p.

Müller, E. 1950. Die schweizerischen Arten der Gattung *Leptosphaeria* und ihrer Verwandten. Sydowia 4: 185-319.

_____ and J.A. von Arx. 1962. Die Gattungen der didymosporen Pyrenomyceten. Beitr. Kryptogamenfl. Schweiz 11(2): 1-922.

Petrak, F. 1914. Beitrage zur Pilzflora von Mahren und Osterreich-Schlesien. I. Ann. Mycol. 12: 471-479.

Rappaz, F. 1987. Taxonomie et nomenclature des Diatrypacées à asques octosporés. Mycol. Helvetica 2: 285-648.

Rogerson, C.T. and G.J. Samuels. 1994. Agaricicolous species of *Hypomyces*. Mycologia 86: 839-866.

Samuels, G.J., A.Y. Rossman, R. Lowen, and C.T. Rogerson. 1991. A synopsis of *Nectria* subgen. *Dialonectria*. Mycol. Pap. 164: 1-48.

Shoemaker, R.A. 1976. Canadian and some extralimital *Ophiobolus* species. Canad. J. Bot. 54: 2365-2404.

_____. 1984a. Canadian and some extralimital *Leptosphaeria* species. Camad. J. Bot. 62: 2688-2729.

-----. 1984b. Canadian and some extralimital *Nodulosphaeria* and *Entodesmium* species. Canad. J. Bot. 62: 2730-2753.

Simmons, E.G. 1985. Perfect states of *Stemphylium*. II. Sydowia 38: 284-293.

Walker, J. 1980. *Gaeumannomyces*, *Linocarpon*, *Ophiobolus* and several other genera of scolecospored ascomycetes and *Phialophora* conidial states, with a note on hyphopodia. Mycotaxon 11: 1-129.

Webster, J. 1969. The *Pleospora* state of *Stemphylium triglochinicola*. Trams. Brit. Mycol. Soc. 53: 478-482.

Wehmeyer, L.E. 1933. The genus *Diaporthe* Nitschke and its segregates. Univ. Michigan Stud. Sci. Ser. 9: 1-349.

MYCOTAXON

Volume LXVIII, pp. 405-416 July-September 1998

RHYTISMA AMERICANUM SP. NOV.: A PREVIOUSLY UNDESCRIBED SPECIES OF RHYTISMA ON MAPLES (ACER SPP.)

GEORGE W. HUDLER and SANDRA JENSEN-TRACY
Department of Plant Pathology, Cornell University, Ithaca, NY 14853

MARK T. BANIK
U.S. Forest Service, Forest Products Laboratory, Madison, WI 53705

ABSTRACT

Differences in developmental morphology, host range, and restriction fragment length polymorphisms are consistent with the hypothesis that the species of *Rhytisma* currently causing an epiphytotic on Norway maple *(Acer platanoides*) in the northeastern United States is not the same fungus that is endemic on red and silver maples in North America. The latter fungus, erroneously designated as *R. acerinum* for many years, is a different and previously undescribed species. We propose *Rhytisma americanum.*

INTRODUCTION

About 10 years ago, we reported an unusual epidemic of tar spot caused by *Rhytisma acerinum* (Pers.) Fr. on Norway maple (*Acer platanoides*) foliage in several upstate New York communities (Hudler *et al.*, 1987). Since then, we have found reports of the disease in Ohio for over 50 years. It also occurs throughout New York and into neighboring Massachusetts, Vermont, Pennsylvania, and New Jersey in the U.S. and in southern Ontario, Canada. Several features of the fungus we reported earlier are sufficiently different from *R. acerinum* on native red (*A. rubrum*) and silver (*A. saccharinum*) maples to cause us to continue to observe and study all three hosts and their respective tar spots.

First, the fungus on *A. platanoides* seems to be limited only to that host species. In many instances where heavily infected *A. platanoides* grow next to native (to North America) red, silver, and sugar (*A. saccharum*) maples, the other host species remain free of disease. Second, the morphology of the fungus on *A. platanoides* differs from that on *A. rubrum* or *A. saccharinum.* The former matures in autumn as relatively large (20+ mm diam) black spots whereas the latter pathogen matures as circular masses of stromatic tissue rarely more than 10 mm in diameter. Third, the *A. platanoides* fungus produces copious amounts of conidia from mid-August until leaf fall in late September (Hudler *et al.*, 1987). We had never seen evidence of an anamorphic stage of the pathogen on *A. rubrum* or *A. saccharinum* and were unable to find samples of such in herbaria at Cornell (CUP) or at the U.S. National Fungus Collection in Beltsville, MD (BPI).

A review of previous reports of *R. acerinum* on *Acer* spp. indicates that the pathogen was first described by Persoon (1797, 1801) as *Xyloma acerinum* following his examination of specimens on *A. platanoides*. Fries transferred the fungus to *Rhytisma* upon examination of specimens on another native European maple, *A. pseudoplatanus* (from collections of Schmidt & Kunze, exs. 105 and Mougeot & Nestler, exs. 77) - and also recorded the fungus on endemic North American maples - *A. rubrum* and *A. negundo* (Fries 1823). The species on all of these hosts has been treated as *R. acerinum* to the present day although both J. Müller (1893) and K. Müller (1912) suggested that there might be two races, if not two species, of *Rhytisma* on native European maples based on different sizes of stromata and host specificity. K. Müller concluded that the pathogen on *A. pseudoplatanus* was a different race than the one on *A. platanoides* .

In a report comparing maple tar spots from Europe with those from the United States, Bracher (1924) raised the possibility that the *Rhytisma* on *A. saccharinum* in North America was a different species than that on *A. pseudoplatanus* in Europe. She indicated that results of additional observations would be forthcoming, but unfortunately, they never appeared in print. In the first report of *Rhytisma* on *A. platanoides* in North America, Waterman (1941) also noted that the fungus did not correspond with descriptions of either *R. acerinum* or *R. punctatum*, a related pathogen of some other maples (Woo and Partridge, 1969).

Based on the historical record and on the striking differences in comparative morphology of the fungi in question, we hypothesize that the pathogens on *A. rubrum* and *A. saccharinum* are the same species and that they are different from the pathogen on *A. platanoides* which has recently become so widespread in the northeast U.S. Furthermore, we hypothesize that the pathogen on *A. platanoides* in North America is the same as that commonly occurring in Europe and that it is the true *R. acerinum* described by Persoon, then Fries. If both of those hypotheses are correct, then it follows that the pathogen on the North American maples, *A. rubrum* and *A. saccharinum*, has been erroneously designated as *R.*

acerinum by Fries and it is, in fact, a distinct species. The following comparisons were made and experiments conducted in an effort test these hypotheses.

DEVELOPMENTAL MORPHOLOGY.

Spore dispersal and subsequent development of both anamorph and teleomorph states of tarspots on *A. platanoides*, *A. rubrum*, and *A. saccharinum* were monitored during the course of several years between 1987 and 1997. Ascospores are ejected from overwintered stromata during about a 4 week period beginning as new leaves emerged from buds. First symptoms of impending disease are chlorotic spots that appear on new foliage in central New York State from mid-June to the first week in July. In the case of the *A. rubrum /A. saccharinum* pathogen, a small (<0.5 mm diam) black mass of fungal tissue appears near the center of each spot. That mass contains a single pycnidium of the *Melasmia* type (Grove, 1937) in which minute (c. 5 µm long), allantoid conidia are produced. Pycnidia are detectable for no more than 3 weeks; thereafter the spots rapidly grow to become typical thickened black stromata comprised of fertile white fungus tissue overlain with a black rind. By autumn, from 2 to 12 parallel sinuous channels of ascogenous tissue (the number of channels varying with the size of the stroma) are discernible by the depressions they cause in the rind of each stroma. In many cases stromata are surrounded by a bright yellow border of chlorotic host tissue.

The *A. platanoides* pathogen also causes chlorotic spots in host leaves as a first symptom of disease. Within 3 weeks, each chlorotic spot usually holds a dozen or more discrete black masses of fungus tissue each about 1 mm diameter and vaguely reminiscent of spots caused by *R. punctatum* on various maples. Stromatal tissue continues to enlarge (faster on shade leaves than in sun) until the individual masses in each spot coalesce to form a stroma averaging 13 mm in diameter. Some spots are more than 25 mm wide. Furthermore, the stromata on *A. platanoides* are much thinner than those on *A. rubrum* and *A. saccharinum*, rarely exceeding 0.5 mm. By mid-August, from 6 to 18 individual pycnidia, each discernible by a minute papilla at its ostiole, can be seen from above. The pycnidia produce conidia on condiophores which are similar in all respects to *Melasmia acerinum* Lev. described by Jones (1923), Grove (1937) and Sutton (1980). When spots with mature pycnidia, collected any time after mid-August, are immersed in water or dilute gluteraldehyde, the liquid is quickly made cloudy with profuse numbers of conidia released by the fruit-bodies. As the time of normal leaf drop approaches, developing apothecia also become visible as discrete blisters or bumps in the rind. These rarely coalesce and never assume the sinuous character of the *A. rubrum* /*A. saccharinum* pathogen.

Virtually all stromata from all species of *Acer* collected during our investigations required a minimum of 5 months incubation out-of-doors during winter before the hymenial tissue would mature and the rind would split to allow for ascospore discharge. Surface disinfested leaf pieces incubated indoors on moist sand in a 2-5°C refrigerator rarely and unpredictably mature to produce ascospores. Similarly, efforts to hasten maturation of stromata by warming them up after only 3 or 4 months outdoors rarely succeeded.

Mature ascomata will eject spores when the stromata are thoroughly moistened and placed in a moist chamber in a refrigerator for 2-8 h. Within 1/2 h after stromata so treated are warmed to room temperature (20-25°C), spore dispersal begins. Viewed microscopically, spores in chilled asci often appear to be compressed into spring-like coils. They are ejected one at a time as they move to an apical pore in the ascus and the "tension" of the coil is released. Each ascospore is surrounded by a gelatinous sheath that is at least twice as thick as the spore itself, and the sheath remains visible for about 4h after ejection if the spore is kept on a moist substrate. The gelatinous appendages at each end of an ascospore, as illustrated by Cannon and Minter (1984), appear to be the final stages of drying of the sheath around each spore.

The hymenium of the *A. platanoides* pathogen varies from silvery gray, sometimes with a slightest tinge of green to light yellowish orange. Individual ascospores are hyaline and average 75 µm long (range: 60 µm - 106 µm) x 2.5 µm wide. Eight spores are produced in each ascus; asci averaging 99 µm long (range: 76-126 µm). Paraphyses interspersed amongst the asci are 1-2 µm wide, usually about as long as the asci but occasionally 10-20 µm longer, flexuous and without prominently curved tips.

In contrast, hymenia of the *A. rubrum* /*A. saccharinum* pathogen are consistently yellowish orange. Ascospores are hyaline and average 69 µm long (range 50-88 µm). They are also contained in thin-walled asci averaging 82 µm long (range 58-98 µm). Attendant paraphyses range in length from about as long as the longest ascus to 10-15 µm longer and are 1-2 µm wide. Those at the edges of the apothecia have conspicuously curved tips while those nearer the center are either straight or slightly curved.

In addition to recording development of the pathogen in the field in the northeast U.S., we examined specimens of both the Schmidt and Kunze collection and the Mougeot and Nestler collection used by Fries and held at UPS. We also examined over 500 specimens at BPI. Unfortunately, both specimens from UPS and all but 36 at BPI (15 on *A. rubrum*, 2 on *A. saccharinum*, 2 on *A. platanoides*, 17 on *A. pseudoplatanus*) are of stromata collected in the autumn with only developing ascomata and no mature spores. Nonetheless, information gleaned from those specimens was consistent with our observations regarding development in the field.

ASCOSPORE GERMINATION

Our repeated attempts to obtain cultures of any of the *Rhytisma* spp. by discharging ascospores onto wide variety of agar media failed. Some spores from each spore shower usually germinate, but germ tubes lyse within a few hours. Stephan and Osorio (1989) reported similar difficulties in their attempts to grow species of conifer needle pathogens, also members of the Rhytismataceae, from ascospores. However, they found that germ tube length and shape prior to lysis were unique for each species examined. We noted that on 1% w/v water agar, each ascospore from *A. platanoides* produces one short (< 10μm), cylindrical germ tube that swells to about the same diameter as the parent spore before it bursts. Spores of the *A. rubrum/A. saccharinum* pathogen, on the other hand, consistently produce one roughly spherical, slightly pigmented outgrowth of the parent spore that grows to about twice the width of the spore before it bursts.

HOST RANGE

Although tar spot on *A. rubrum* and *A. saccharinum* seems to have been a common disease in eastern North America for hundreds, if not thousands, of years, it rarely causes enough damage to warrant concern about the health or landscape value of affected trees. *Acer saccharum* is a rare host and it and *A. pensylvanicum* also host the morphologically distinct *R. punctatum*. As the disease on *A. platanoides* spreads across the countryside, however, its grotesque appearance and occasional induction of premature defoliation on that host are so conspicuous that they raise public concern about the fate of infected trees. Increasing incidence of *Rhytisma* on *A. platanoides* has not been accompanied by a concommitant increase of the disease on other native *Acer* spp. but a tar spot resembling the *A. platanoides* pathogen is occasionally found on introduced specimens of a European native, *A. campestre*.

In addition, we note that while *Rhytisma* infection of *A. rubrum* is relatively common within genetically heterogeneous stands of the tree, *A. saccharinum* seems to be more variable in susceptibility. Many specimens of the latter growing in the vicinity of what should be ample inoculum from either *A. rubrum* or *A. saccharinum* are completely free of disease while others nearby may average 6 or more spots per leaf.

Unfortunately, our efforts to inoculate potted seedlings and small saplings of various species of *Acer* in controlled environments have not been successful. In two attempts to induce "natural" infection in the field by placing potted seedlings in screen-covered boxes in sites at least a kilometer from the nearest known occurrence of a particular source of *Rhytisma* and then introducing inoculum in the form of stromata on previously infected leaves, we found further indication of host specificity. When the source of inoculum was previously infected *A. rubrum* leaves, only *A. rubrum* became infected. *A. platanoides*, *A. saccharinum* and *A. pensylvanicum* remained free of disease at that site. When the source of inoculum was previously infected leaves from *A. platanoides*, only *A. platanoides* seedlings became infected; other species remained disease free.

RESTRICTION FRAGMENT LENGTH POLYMORPHISMS

Characterization of restriction fragment polymorphisms (RFLPs) from polymerase chain reaction (PCR)-amplified DNA in the internal transcribed spacer (ITS) region has become a valuable tool to aid in distinguishing species of several genera of fungi (Persson *et al.*, 1996; Buscot *et al.*, 1996). To further our understanding of *Rhytisma* taxonomy, a total of 39 stromata from various species of *Acer* and from various sites in the U.S. and one site in Canada were processed according to a protocol developed by Volk *et al.* (1996) to extract and amplify nuclear rDNA from fungi. Template DNA for PCR amplification was obtained from stromata by scraping a small amount of tissue (clypeus plus stromatal hyphae) from each one. A section of leaf tissue visibly free of *Rhytisma* but within 5 mm of a stroma was also included as a control for each tar spot sampled. Additionally, ascospore deposits from stromata on leaves of each host were collected on sterile glass microscope slides. To prepare those for PCR amplification, the spores were washed from the slides with 8 µl TE and subjected to two cycles of freezing at -70°C and thawing at 78°. Then, 5 µl of each suspension was used as template DNA for amplification. Primers used were ITS-4(TCCTCCGCTTATTGATGC) and ITS-5(GGAAGTAA-AAGTCGTAACAAGG) (Operon Technologies, Alameda, CA).

Of stromata from *A. platanoides* leaves, 16 from 5 sites in New York and 1 site in Ontario, Canada yielded amplification products. They were compared with products from ten stromata on *A. rubrum* from eight sites in New York and one in, five stromata on *A. saccharinum* from one site in New York and two in Wisconsin, four stromata on *A. pensylvanicum* from three sites in New York, three stromata on *A. saccharum* from one site in New York, and one stroma on *A. campestre* in New

York. Of 34 attempts to retrieve amplification products from asymptomatic leaf tissue, 14 were successful. Spore deposits from stromata on *A. rubrum* from two sites in New York and from *A. platanoides* from two sites in New York and from *A. pensylvanicum* infected with *R. punctatum* from one site in New York and one in Maine also yielded amplification products. Specific information about collection sites, dates, etc. is available from the authors upon request.

The PCR product for the ITS region for each stroma and ascospore collection and for one healthy leaf sample was about 600 bp. Two other healthy leaf samples yielded products of about 750 bp, and eleven more had products containing both 600 and 750 bp. Twenty samples of asymptomatic maple leaf tissue were free of amplification products.

Following amplification, 4 µl of unpurified reaction product was digested in 5 µl of each of the restriction enzymes *Hae* III *Hha* I, *MSP* I, and *RSA* I (Promega, Madison, WI). Digestion was conducted in the required amount of buffer supplied with each enzyme in a total volume of 20 µl, incubated at 37°C for 16 h. The enzymes yielded two, three, five and five pattern types, respectively (Table 1). There was no difference between samples from stromata or from ascospore deposits, and the results thereof were pooled in subsequent analyses.

All samples of the fungus on *A. platanoides* and *A. campestre* exhibited the same RFLP pattern with *Hae* III. Samples from the other species had a different pattern. *RSA* I produced three RFLP patterns: one shared by stromata or spores from *A. rubrum* and *A. saccharinum*, one by those *from A. platanoides* and *A. campestre*, and one from *A. saccharum* and *A. pensylvanicum*. *Hha* I and *MSP* I each yielded five different patterns. With both enzymes, however, one pattern was unique to *A. rubrum* and *A. saccharinum*, two were unique to *A. platanoides* and *A. campestre*, one was unique to *A. saccharum*, and one was unique to *A. pensylvanicum.*

With information gained from the RFLP it was possible to place all of the collections into one of five restriction groups (Table 2). Restriction group I was comprised only of material from stromata or spores from *A. rubrum* and *A. saccharinum*, restriction group II was from *A. campestre* and *A. platanoides*, and restriction group III was from *A. platanoides*, only. Both restriction groups II and III were collected from the same site and, in some cases, may have come from the same tree. Restriction group IV was from material from *A. pensylvanicum* and restriction group V was from *A. saccharum*. Because collections of the latter two restriction groups were few in number, they will be the subject of future investigations.

Table 1. Approximate size, in base pairs, for the fragments of each pattern type produced by the digestion of the ITS region of 43 collections of *Rhytisma* with four restriction enzymes.

Pattern Type	Restriction Enzyme *Hae* III	*Rsa* I	*Hha* I	*MSP* I
A	240,115,80	350,115, 80	260,245,75	300,105,80
B	240,80,60,50	475,125	335,150,70	300,120,85
C	-	290,135,110,90	335,200	300,125,100
D	-	-	320,260	150,125,80,65
E	-	-	235,70	140,110,90,70

Table 2. Restriction Groups based on similarity of RFLPs of the ITS region.

Group No.	Restriction Enzyme Pattern Type *Hae* III	*Rsa* I	*Hha* I	*MSP* I	Hosts	No. of Samples
I	A	A	A	A	*A. rubrum/* *A.saccharinum*	17
II	B	C	D	D	*A. platanoides* *A. campestre*	16
III	B	C	E	E	*A. platanoides*	3
IV	A	B	C	C	*A. pensylvanicum*	6
V	A	B	B	B	*A. saccharum*	3

Nonetheless, in view of our observed differences in morphological development, host range, and RFLP patterns, we concluded that the pathogen on *A. rubrum* was the same as the one on *A. saccharinum*, that it was a different species from the one on *A. platanoides*, and that it has never before been formally described. Thus, we propose *Rhytisma americanum* sp. nov.

Rhytisma americanum Hudler and Banik sp. nov.

Stromata: nigra, praeter ubicumque margines aureolis restricta, plus minusve cylindrea, diametris variabilibus sed raro minus quam 3 mm vel plus quam 10 mm, usque ad 1.5 mm crassa decrescentia margines versus, interdum textura chlorotico foliis halonata, in paginis foliis hospitis

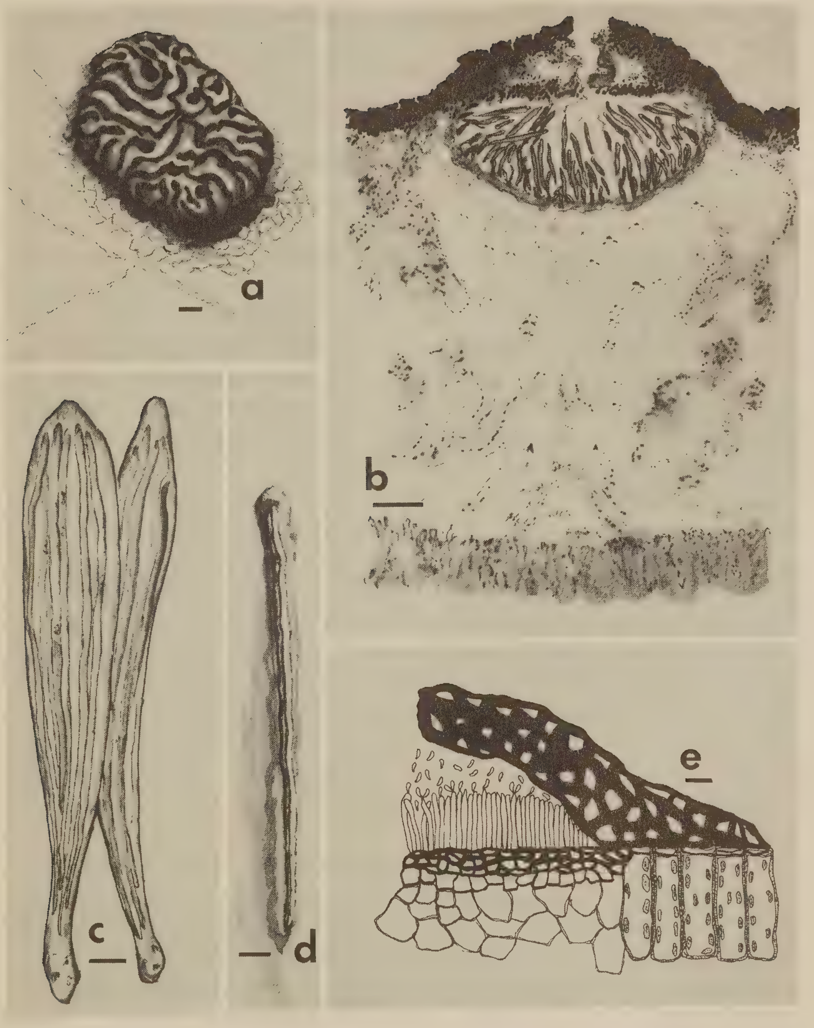


Fig. 1. *Rhytisma americanum* sp. nov. a, mature stroma split open prior to ascospore discharge; b, cross-section of stroma showing part of one ascoma; c, typical asci with ascopores; d, cast ascospore with gelatinous sheath; e, conidioma with conidia (*Melasmia* sp.).
Scale bars: a = 1 mm, b = 50 µm, c-d = 10 µn, e = 5 µm

adaxialibus restrictis. ***Conidiomata:*** ephemera in textura immatura stromate ubi *ca* 0.5 mm diam. intra 3 hebdomades evanescentia; per rimam irregularem vel interdum ostiolum simulantium dehiscentia; pariete inferiori stratis ca. 15 µm crassitie cellulis conidiogenis hyphis vegetativis parietibus fuscis incrassatis apprime inter cellulas hospitis aprime manifeste subtentis; pariete superiore, clypeo, stratis 10 µm crassitie hyphis fuscis nigrescentis. ***Cellulae conidiogenae:*** phialides, 22-25 x 1.8-2.1 µm, laeves, hyalinae, cylindricae, interdum apicem versus angustatae. ***Conidia:*** 5-7 x 1.5-2 µm, hyalina, allantoidea, interdum apicem generativum versus angustata, aseptata. ***Ascomata:*** post conidiogenesum apparententer primum crescent, post hiemem et 4 menses minimum maturescentia; ***aspectu superficiali:*** ascomatibus canalibus sinuatibus parallelibus formantibus usque ad longitudinem stromatis extensis, ante dehiscentiam canalibus 200-400 µm latibus cortica stromatis confluentibus sed parce impressibus, margine indistincto; ***aspectu medio-verticali:*** ascomatibus perfecto immersis textura oblita hyalina usque ad profunditem 500 µm circumcinta, clypeo fusco nigrescenti textura obliqua crassissimo (ca. 60 µm) centrale ad margines decrescentibus et corticem stromatis super textura infertili stromatis conflato. ***Hymenium:*** paraphysibus hyalinibus, cylindricis, 80-120 µm longis, aseptatis, apicale interdum crispatis contortisve. ***Asci:*** tenuiparietati, unitunicati, cylindrici, 60-100 µm longi, apicale non inspissati, iodo non caerulescentes, per porum singularum apicalem dehiscentes. ***Ascosporae:*** filiformes, 50-88 x 1.5-2.5 µm, hyalinae, aseptatae, vaginatae gelatinosae ca 2 µm crassae in statu humectato manifestae obtegentes. ***Habitat:*** in foliis *Aceris rubris*, *Aceris saccharinis*, *raro Aceris saccharis* in America Boreali orientalemversus abundat sed alibi raro.

Stromata: on abaxial surfaces only of host leaves, black, ± cylindrical except where limited by major veins, diam variable but rarely less than 3mm or more than 10 mm, up to 1.5mm thick at center and tapered to leaf surfaceat perimeter, occasionally surrounded by a bright yellow halo of chlorotic host tissue. **Conidiomata:** ephemeral, in developing stromatic tissue when it isca 0.5 mm diam and disappearing within 3 wk. Conidiomata opening via an irregular slit, sometimes resembling an ostiole. Lower wall consisting of a thin (c. 15 µm) layer of conidiogenous cells subtended by vegetative hyphae with dark, thickened walls, especially between host cells. Upper wall comprised of a c.10 µm thick layer of dark brown to black hyphae - the developing clypeus. **Conidiogenous cells:** phialides, smooth, hyaline, cylindrical, sometimes tapered at the apex., 22-25 µm x 1.8-2.1 µm. **Conidia:** hyaline, allantoid, sometimes tapered at

generative end, aseptate, 5-7 μm x 1.5-2 μm. **Ascomata:** developing apparently after conidiomata have completed sporulation, maturing after an overwintering period of at least 4 months. **In surface view**: ascomata develop as parallel sinuous channels extending up to the entire length of the stroma. Prior to dehiscence, the surface of each channel is 200-400 μm wide, continuous with the rind covering the rest of the stroma, and sinking slightly below adjacent supporting tissue. Perimeter line absent. **In median vertical section**: ascomata entirely below the surface of the stroma, surrounded by hyaline *textura oblita* which may extend to a depth of 500 μm. Clypeus dark brown to black *textura globulosa* thickest near center (ca 60 μm) and tapering at edges to join rind surrounding non-fertile stromatal tissue. **Hymenium**: Paraphyses hyaline, cylindrical, 80-120 μm long, non-septate, occasionally curled or otherwise distorted at the tip. Asci thin-walled, unitunicate, cylindrical, 60-100 μm long, without apical thickening, not blued at the tip with iodine, dehiscing via a single apical pore. Ascospores: filiform, 50-88 μm x 1.5-2.5 μm, hyaline, aseptate, surrounded by a gelatinous sheath ca 2μm thick visible on recently ejected spores on a moist surface. **Habitat:** On leaves of *Acer rubrum*, *A. saccharinum* and, rarely, *A. saccharum*. Common in North America east of the Great Plains, uncommon elsewhere.

Holotype: USA. Roosevelt State Park, Parking Lot Number 3, Westchester County, NY. Coll. 18 September 1996 and incubated outdoors in Ithaca, NY until 29 May 1997, CUP 65337
Isotypes: BPI (No. 744415) and IMI.
Paratypes on *A. rubrum* and *A. saccharinum* collected from various locations in New York State are deposited at CUP, BPI, and IMI.

ACKNOWLEDGMENTS

We thank S.E. Hudler for preparing the illustrations; Brenda Neal and Sandra Buxton for technical assistance; R.P. Korf , D.W. Minter, A.Y. Rossman, and B.D. Wingfield for critical reviews of the manuscript, and R. A. Humber for the Latin translation of the description. Dr. S. Ryman, Curator of the Herbarium at the University of Uppsala graciously allowed use of collections of Schmidt and Kunze and Mougeot and Nestler.

REFERENCES

Bracher, R. 1924. Note on *R. acerinum* and *R. pseudoplatanus*. Trans. Brit. Myc. Soc. 9: 183-186.

Buscot, F., Wipf, D., DiBattista, C., Munch, J.B., and Martin, F. 1996. DNA polymorphisms in morels: PCR/RFLP analysis of the ribosomal DNA spacers and microsatellite-primer PCR. Mycol. Res. 100: 63-71.

Cannon, P.F. and Minter, D.W. 1984. *Rhytisma acerinum.* Commonw. Mycol. Inst. Desc. Path. Fungi and Bacteria. No. 791.

Fries, E.M. 1823. Systema Mycologicum, sistens fungorum ordines, genera et species hue usque cognitas. Ernest Mauritius, Greifswald.

Grove, W.B. 1937. British Stem and Leaf Fungi (Coelomycetes), Vol. 2. Cambridge Univ. Press. Cambridge.

Hudler, G.W., Banik, M.T. and Miller, S. 1987. Unusual epidemic of tar spot on Norway maple in upstate New York. Plant Dis. 71: 65-68.

Jones, S.G. 1923. Life history of *Rhytisma acerinum*: a preliminary account. Ann. Bot. 39: 41-73.

Müller, J. 1893. Zur Kenntinis des Runzelschorfes und der ihm ähnlicken Pilze. Jahrb. f. Wissenschaftliche Botanik 25: 607-627.

Müller, K.1912. Zur Biologie der Schwartzfleckendrankheit der Ahornbäume, hervorgerufen durch den Pilz *Rhytisma acerinum.* Centralblatt.fürBakteriologie,Parasitenkunde,und Infektionskrankheiten 36: 67-98.

Persoon,C.H. 1797. Tentamen Dispositionis Methodicae Fungorum. IV-V.

Persoon, C.H. 1801. Synopsis Methodica Fungorum. Gottingae.

Persson, Y., Erland, S., and Jansson, H. 1996. Identification of nematode-trapping fungi using RFLP analysis of the PCR-amplified ITS region of the ribosomal DNA. Mycol. Res. 100: 531-534.

Stephan, B.R. and Osorio, M. 1989. Appressoria and their possible use for identification of the Rhytismataceae (Ascomycetes). Pp. 108-111 in Merrill, W. (ed.) Proc. IUFRO Conf. on Foliage Diseases. Carlisle, PA

Sutton, B.C. 1980. The Coelomycetes. Commonw. Myc. Inst. Kew, Surrey, England.

Volk, T.J., Burdsall, H.H.Jr. and Banik, M.T. 1996. *Armillaria nabsnona*, a new species from western North America. Mycologia 88: 484-491.

Waterman, A.M. 1941. Diseases of shade and ornamental trees: annotated list of specimens received in 1940 at the New Haven office, Division of Forest Pathology. Plant Dis. Rep. 25: 181-182.

Woo, J.Y. and Partridge, A.D. 1969. The life history and cytology of *Rhytisma punctatum* on big leaf maple. Mycologia 61: 1085-1095.

MYCOTAXON

Volume LXVIII, pp. 417-427 July-September 1998

ALTERNARIA THEMES AND VARIATIONS (224-225)

EMORY G. SIMMONS

717 Thornwood Road, Crawfordsville, IN 47933

ABSTRACT

Alternaria destruens Simmons, sp. nov., is described from *Cuscuta gronovii* Willd. It is compared with and differentiated from other species and species-groups of *Alternaria* that typically produce short unbranched chains of relatively small conidia in young cultures.

XXV. Brevicatenate Species of Alternaria and a New Species from Cuscuta

It is an extremely common experience to observe short, unbranched chains of *Alternaria* conidia arising from plant lesions or debris held overnight in a damp chamber. However, it is impractical and, in a classification sense, hazardous to attempt to make species determinations from such uncontrolled growths on substrates of unknown nutritional composition.

Additional to the low classification value of such precocious *Alternaria* sporulation is the fact that isolates from such chains may or, quite likely, may not retain the short-unbranched character in axenic culture. For example, sporulation of one isolate in culture may develop as low bushy clumps of branching conidiophores and chains of closely adjacent conidia (the "alternata" group of *Alternaria* species). Another isolate may produce similar branching clumps in which, however, conidia are separated by conspicuous, often markedly elongate secondary conidiophores (the "infectoria" group). Yet another isolate may develop with one or more branching tufts of conidia borne aloft on extraordinarily long, erect primary conidiophores (the "arborescens" group).

An earlier paper in this *Alt.T&V* series (Simmons and Roberts, 1993) presented a preliminary overview and guide to the major kinds of stable sporulation patterns observed in several hundred isolates of small-spored *Alternaria*. In addition to the group patterns named above, two somewhat similar groups were characterized by their ability not only to produce unbranched chains of 5-8 conidia on field lesions but also to perform in a similar manner in culture and to maintain this short-chain habit through the first several days of growth under controlled conditions (the "brevicatenate" group).

The brevicatenate sporulation pattern was the most common one found among hundreds of isolates examined from East Asia sources in the Simmons and Roberts study (1993). This finding reflected to a large extent the nature of most of the source material, blackspot lesions of Japanese pear, which was the focus of the study and which often yielded the distinctive short-chained *Alternaria gaisen* Nagano (see Simmons, 1993).

Brevicatenate *Alternaria gaisen* was the only species of this sporulation group referred to by name in the 1993 study. However, a few other named species are arguably of this sporulation group and, like *Alternaria destruens* described below, distinguishable culturally, microscopically, and pathogenically from *A. gaisen*.

Small-spored, brevicatenate species of Alternaria

Neergaard (1945) proposed an *Alternaria* section *Brevicatenatae* and used the term in a comprehensive sense, i.e., without regard to conidium size, rostration or other character, for half-a-dozen short-chain species known to him. (Neergaard, l.c., proposed several novel "section" names, but used them in a descriptive sense rather than as a formal taxonomic rank. His section names meet none of the pertinent requirements of the Code of Botanical Nomenclature, viz., Art. 7, 10, and 22 (Greuter et al., 1994), are illegitimate, and have no nomenclatural standing in *Alternaria*.)

Simmons (1992) presented some introductory, somewhat pedagogical thoughts on *Alternaria* spore forms and sporulation patterns of all sorts, but included only *A. dianthicola* Neergaard (1945) as a representative of a small-spored member of an unbranched catenate group of species.

Simmons subsequently outlined, illustrated, and discussed a basic set of 6(-9) sporulation patterns for small-spored isolates (Simmons and Roberts, 1993) but, as mentioned above, included only *A. gaisen* as a named representative of the brevicatenate pattern.

An additional species that produces unbranched chains of ca. 4-8 non-beaked conidia is described below. Following that description is a comparison of the new species with several established species whose short-chain character might invite confusion in a simple key but whose other characters furnish a demonstrable basis for segregation.

224. **Alternaria destruens** Simmons, sp. nov. Fig. 152
Etym.: L. *destruens*, destroying (of *Cuscuta*)

Ex cultura in agaro PCA descripta. Coloniae constans proparte maxima ex conidiophoris abundis in annulis concentricis incrementi diurnalis. Conidiophora primaria simplicia vel plerumque uniramosa, vulgo 125-160 x 4-5µm; hyphae alternae fasciculatae conidiogenae ad 1.0-1.5mm longae. Conidia brevicatenata 4-8, demum aliquando 10-12; catena aliquando ramo conidiorum 1-4. Conidia ovoidea vel anguste ellipsoidea, 25-40(-46) x 10-13µm, erostrata sed plerumque conidiophoro secundario apicali 3-5 x 3µm vel saepe et conspicue 20-80 x 3µm, 3-6 transeptata et 1-2 longiseptata, leniter luteobrunnea et modice punctata.

Habitatio typi in Cuscuta gronovii Willd., in palude Vaccinium macrocarpum Ait., Rochester, Massachusetts, U.S.A., 1997. Typus: partes ex cultura EGS 46-069 (13.xi.1997 acced., F. Caruso isol. viii.1997 = T. Bewick "D") desiccatae et in **BPI** *(holotypus) et saltem in* **IMI** *(isotypus) conservandae.*

Alternaria destruens first came to my attention in 1986 as an isolate for which a high level of pathogenic aggressivity to swamp dodder, *Cuscuta gronovii*, was being demonstrated by T. A. Bewick as part of his doctorate thesis work at the University of Wisconsin (Bewick, 1987). One of additional strains isolated in August 1997 from diseased swamp dodder growing in a cranberry bog in Rochester, Massachusetts, has been selected here to furnish the type specimen.

Colonies develop on PCA to a radius of ca. 2.5 cm. within 5-6 d. At this age the colony has a small central area and three well-defined concentric rings of very abundant but uncrowded primary conidiophores arising directly from the agar surface. Each conidiophore bears a simple terminal chain of conidia. Nonsporulating aerial hyphae are lacking in these areas. These densely conidial rings represent successive advancing edges of the colony that were exposed to the fluorescent light period of the daily light cycle.

Alternating with the densely conidial rings are rings of very long, less crowded, solitary or usually fasciculate aerial hyphae bearing a few scattered lateral conidiophores and their terminal conidia. These less dense rings represent growth initiated during the dark portion of the daily illumination cycle.

Primary conidiophores in the light-induced rings commonly reach 125-160 x 4.5μm in size. They frequently are 1-branched about half way between base and apex. The fasciculate hyphae in the dark-period rings are ca. 1.0-1.5 mm. in length.

Each conidiophore produces a single unbranched chain of 4-8 conidia during the initial 5-6 d. of colony development; chain length may increase to 10-12 units as the colony ages beyond one week. A lateral conidial branch originating in a conidium of the chain arises infrequently during early growth, occuring as a solitary conidium or as a short chain of 2-4 conidia. As the colony ages (10-12 d.), short lateral branches become common but still are rarely more than 1-4 conidia long.

Viewed at 40-50X, most chains appear to be composed of similar, closely adjacent, beakless conidia, i.e., the interspersed secondary conidiophores are to a great extent too short to be seen at low magnifications. However, even at this magnification, large numbers of chains are seen to incorporate 1-2 conspicuous, comparatively long secondary conidiophores among the few spores of young chains. These prominent secondary conidiophores inserted in short, simple chains of conidia are diagnostic in the context of named species of small-spored *Alternaria*.

Conidia in chains of *A. destruens* usually have apical secondary conidiophores that are only 1(-2)-celled, 3-5 x 3μm, or sometimes are so short as to be scarcely differentiated above the apex of the subtending conidium. Frequently, however, the secondary conidiophores are much longer, ca. 20-80 x 3μm. Conidium bodies become 25-40(-46) x 10-13μm, ovoid to narrow-ellipsoid, always beakless except for pseudorostrate apical secondary conidiophores, 3-6 transeptate and 1-2 longiseptate in a few of the transverse divisions, medium yellow-tan, and moderately punctate roughened. Cell formation of conidia in rapidly developing colonies is distoseptate, with only 1-2 major transverse eusepta evident per conidium until cultures age beyond 8-10 d.

Comparisons and Comments

A few well-defined species, from among many that might key into the kind of short-chain group envisioned here, are

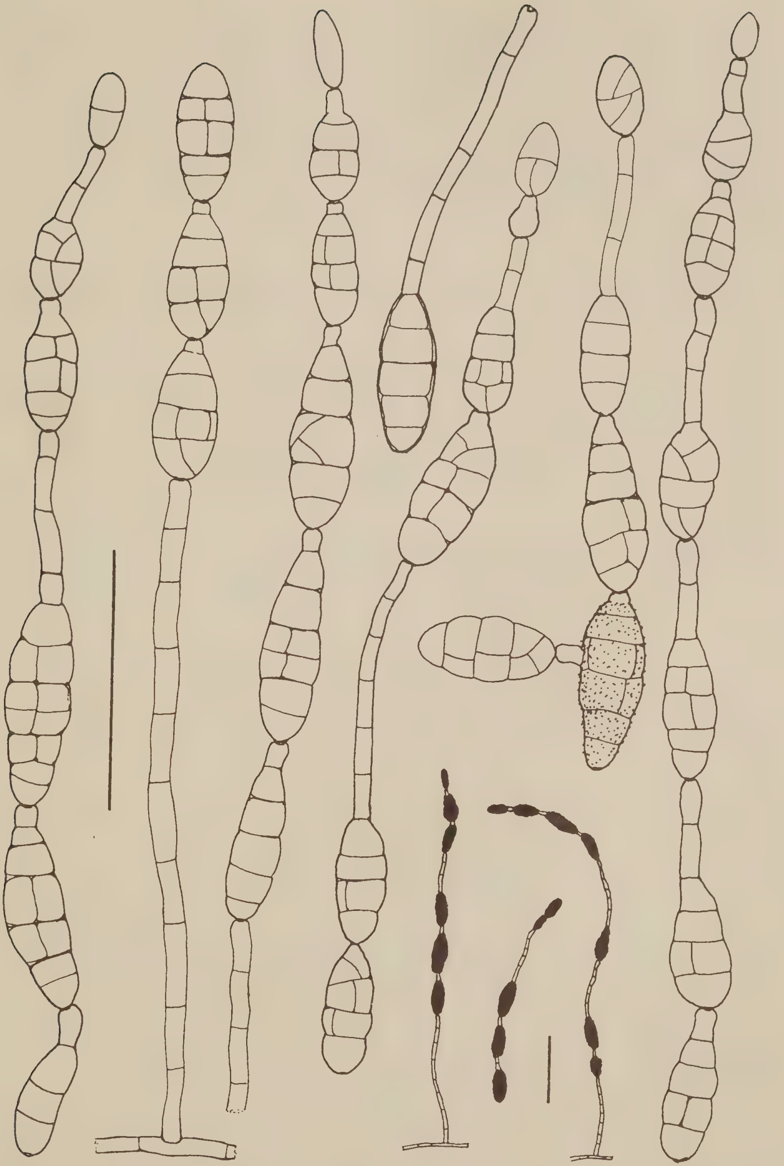


Fig. 152. *Alternaria destruens*: conidia and conidiophores ex type isolate EGS 46-069, 5-6d. on PCA. Habit: conidia (opaque) and conidiophores (clear). Bars = 50μm.

listed below, described and illustrated minimally for comparison purposes, and provided with a literature reference for more detailed information. There is no intent to suggest here any sort of relationship among these species other than characteristic production of short to moderate-length chains of 5-10 conidia, with chain branching absent or minor, when isolates are grown for less than a week in petri dishes on potato-carrot agar (20/20/20), at ca. 22C, under fluorescent light cycled on/off for 8hrs/16hrs.

Alternaria	**Sporulation in young colonies**
	Conidium size (high range); chain length (ch. = chain, unbr. = unbranched) Secondary conidiophore length Host/substrate; representative isolate Literature and comments
destruens Fig. 153A	25-40(-46) x 10-13μm; ch. 4-8, unbranched Secondary conidiophores (3-)20-80μm *Cuscuta gronovii* Willd.; ES 46-069 Simmons, 1998 (*Alt.T&V* 224) Representing a frequently encountered group of small-spored, brevicatenate species in which interspersed secondary conidiophores range from very short to remarkably long in a single chain.
gaisen Fig. 153B	30-45(-55) x 13-15(-18)μm; ch. 5-9, unbr. Secondary conidiophores 3-5μm *Pyrus pyrifolia* (Burm.) Nakai; ES 90-0512 Simmons, 1993 (*Alt.T&V* 63) Brevicatenate but typically lacking appreciable numbers of secondary conidiophores longer than a single cell.
tenuissima Fig. 153C	32-60 x 14-18μm; ch. 6-10, unbranched Secondary conidiophores 3-7μm *Dianthus* spp.; ES 34-015 Simmons, 1995 (*Alt.T&V* 117) Initial conidia of a chain usually distinctly narrow-tapered distally, whereas conidia of *A. destruens* and *A. gaisen* are broadly rounded before production of an apical conidiophore.

eryngii Fig. 153D	45-60 x 13-18μm; ch. 8-10, branching common Secondary conidiophores 3-20μm *Eryngium* spp.; ES 41-005 Simmons, 1995 (*Alt.T&V* 114) Conidia in short chains that typically and conspicuously branch during early development, unlike young chains of other examples given here.
euphorbiicola Fig. 153E	60-70 x 18μm; ch. 4-5, unbranched Secondary conidiophores 20-40μm *Euphorbia* spp.; ES 38-082 Simmons, 1986, 1994 (*Alt.T&V* 15, 95) Conidia, though in short chains, have conidium bodies larger than those found among the numerous small-spored sporulation groups; secondary conidiophores short to long.
pseudorostrata Fig. 153F	55-90 x 14-20μm; ch. 3-6(-10), unbranched Secondary conidiophores 60-100(-240)μm *Euphorbia* sp.; ES 42-060 Simmons, 1996 (*Alt.T&V* 147) Conidia, though brevicatenate, are larger and are connected by longer secondary conidiophores than those of other distinctive small-spored brevicatenate sporulation groups.

The sporulation pattern of brevicatenate conidia with a few relatively long interpolated secondary conidiophores is found frequently among isolates from many different substrates. It is predictable that additional distinguishable species will be recognized on the basis of microscopic characters augmenting those of the brevicatenate pattern.

No isolate discussed here has any significant resemblance to the three-dimensional pattern of multiple-branching sporulation established for *A. alternata* (Fr.) Keissler (Simmons, 1990). Contrary to the common but erroneous, and certainly undocumented, belief that "*A. alternata* is the most common of the saprophytic *Alternaria* species" (Scheffer, 1992), typical *A. alternata* makes up only a minor portion of any large-scale field survey of plant lesions and debris. A good example exists in the Simmons and

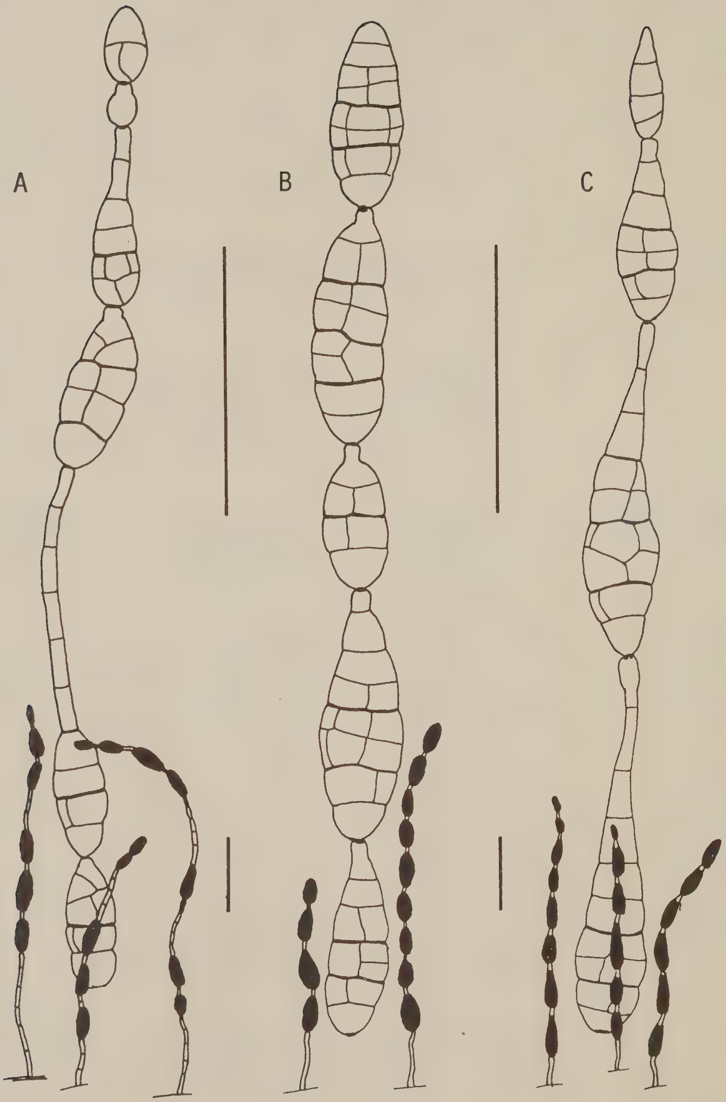


Fig. 153. Conidia, conidiophores and habit of A. *A. destruens* Simmons; B. *A. gaisen* Nagano; C. *A. tenuissima* (Nees : Fr.) Wiltshire.

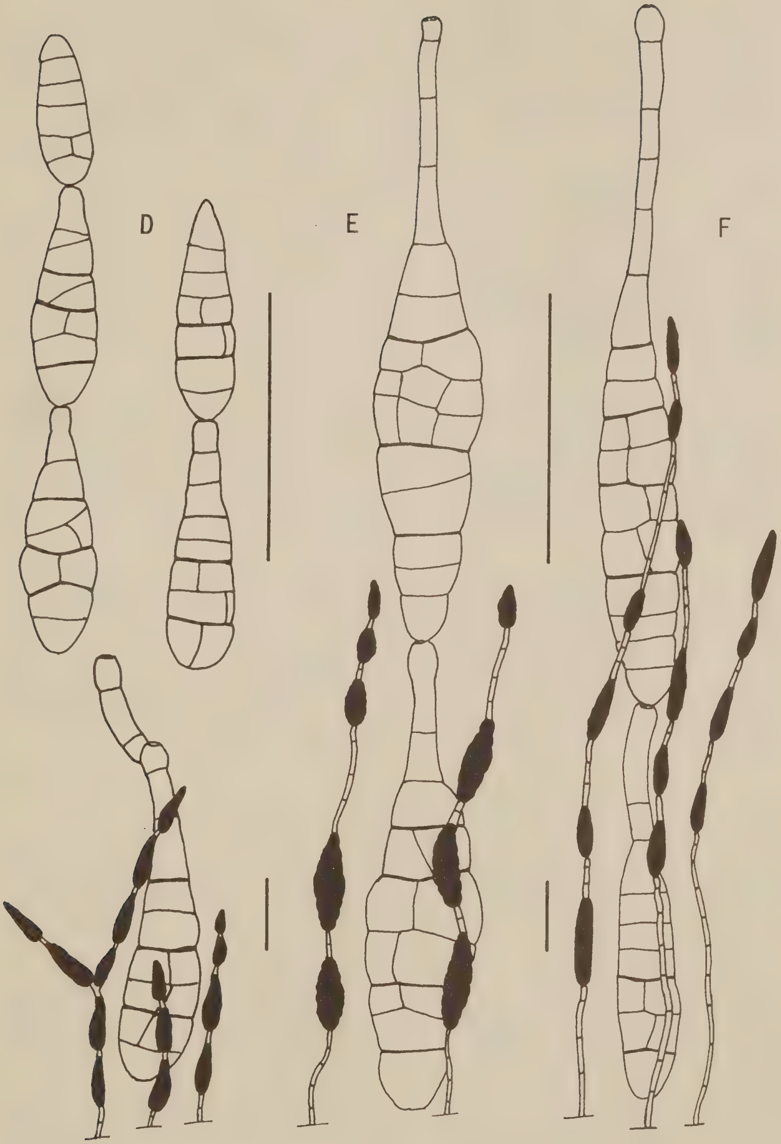


Fig. 153 contd. D. *A. eryngii* (Pers. : Fr.) Hughes & Simmons; E. *A. euphorbiicola* Simmons & Engelhard; F. *A. pseudorostrata* Simmons.

Roberts study (1993) of *Alternaria* inhabitants of blackspot lesions of Japanese pear, where it was found that short-chain isolates, including those of *A. gaisen*, were very common, some other sporulation groups abundant (tenuissima and arborescent groups), but the *A. alternata* group rare.

225. "**Alternaria cuscutacidae** Rudakov"

Inserted here, for the record, is reference to a name that appears in a few publications but never with a description or other validating information. The name, *Alternaria cuscutacidae*, attributed to O. L. Rudakov, is illegitimate and without standing in the nomenclature of the genus.

It appears that Rudakov first used the name in a paper (1960) discussing an alternariosis of dodder (*Cuscuta* sp.) observed in the Kirgiz S.S.R. Subsequent pertinent publications, none legitimizing the name, were on culture and field testing of isolates as potential biocontrol agents (Rudakov, 1961, 1963; Rudakov et al., 1963).

Two isolates labeled *Alternaria cuscutacidae* Rudakov **VKM**-f 1122 and **VKM**-f 1123 (EGS 21-020 and EGS 21-021) were received in 1967 from the USSR All-Union Collection of Type Cultures [**VKM**], USSR Academy of Sciences, Moscow. No data have been available to establish the original source of these isolates. The two do not unquestionably represent a single species. Neither one is *Alternaria destruens*.

ACKNOWLEDGEMENTS

Dr. Mary E. Palm is acknowledged and thanked, once again, for reviewing the prepublication manuscript of this paper and for offering usable syntactic improvements.

Wabash College, Crawfordsville, Indiana, continues its support of my work through an appointment as Research Associate in the Biology Department faculty, which yields much appreciated access to library and electronic communication facilities.

Recognizing the potential of *Alternaria destruens* as a biocontrol agent against swamp dodder, Sylvan Bioproducts, Cabot, Pennsylvania, and United Agri Products, Greeley, Colorado, have supported the program of identification and utilization of the pathogen.

LITERATURE CITED

Bewick, T. A. 1987. Biology and Control of Swamp Dodder (*Cuscuta gronovii*). Ph. D. Thesis. University of Wisconsin (Madison). 119pp.

Greuter, W., and Editorial Committee (eds.) of the International Association for Plant Taxonomy. 1994. International Code of Botanical Nomenclature. Regnum Veget. v. 131. 389pp.

Neergaard, P. 1945. Danish Species of *Alternaria* and *Stemphylium*. Munksgaard, Copenhagen. 560pp.

Rudakov, O. L. 1960. [Alternariosis of dodder.] Izvest. Akad. Nauk. Kirgizskoi SSR, ser. Biolog. 2(7) 51-55.

—— 1961. [A biomethod for the destruction of dodder.] Zaşžita Rastenii (Moscow) 6(6): 23-24.

—— 1963. [A key for determination of fungi on dodders.] Sbornik Rabot po Mikol. Algol. (Frunze) 1963: 3-25.

——, P. I. Zuev, and T. F. Alkhovskaya. 1963. [Field testing of a biological method for controlling dodder at the Kant Beet Sovkhoz.] Sbornik Rabot po Mikol. Algol. (Frunze) 1963: 27-44.

Scheffer, R. P. 1992. Ecological and evolutionary roles of toxins from *Alternaria* species pathogenic to plants. pp. 101-122, in J. Chełkowski and A. Visconti (eds.). *Alternaria* Biology, Plant Diseases and Metabolites. (Topics in Secondary Metabolism - Vol. 3) Elsevier, Amsterdam. 573pp.

Simmons, E. G. 1986. *Alternaria* themes and variations (14-16). Mycotaxon 25: 195-202.

—— 1990. *Ibid.* (27-53). Mycotaxon 37: 79-119.

—— 1992. *Alternaria* Taxonomy: Current Status, Viewpoint, Challenge. pp. 1-35, in J. Chełkowski and A. Visconti (eds.). *Alternaria* Biology, Plant Diseases and Metabolites. (Topics in Secondary Metabolism - Vol. 3) Elsevier, Amsterdam. 573pp.

—— 1993. *Alternaria* themes and variations (63-72). Mycotaxon 48: 91-107.

—— 1994. *Ibid.* (74-105). Mycotaxon 50: 219-270.

—— 1995. *Ibid.* (112-144). Mycotaxon 55: 55-163.

—— 1996. *Ibid.* (145-149). Mycotaxon 57: 391-409.

—— and R. G. Roberts. 1993. *Alternaria* themes and variations (73). Mycotaxon 48: 109-140.

MYCOTAXON

Volume LXVIII, pp. 429-463 July-September 1998

THE LICHEN FAMILY PARMELIACEAE (ASCOMYCOTINA) ON LORD HOWE ISLAND, AUSTRALIA

SIMONE H. J. J. LOUWHOFF and JOHN A. ELIX

Department of Chemistry, The Faculties, Australian National University, Canberra, ACT 0200, Australia

ABSTRACT : The lichen family Parmeliaceae on Lord Howe Island, Australia comprises 31 taxa from 10 genera. These include: *Bulbothrix* (4 spp.), *Flavoparmelia* (2 spp.), *Myelochroa* (1 sp.), *Neofuscelia* (1 sp.), *Paraparmelia* (2 spp.), *Parmelia* (2 spp.), *Parmotrema* (6 spp.), *Relicina* (1 sp.), *Rimelia* (4 spp.) and *Xanthoparmelia* (8 spp.). Two species are described as new to science: *Paraparmelia huttonii* Louwhoff & Elix and *Rimelia stictica* Louwhoff & Elix. The majority of specimens collected on Lord Howe Island produce isidia or soredia, thus indicating that such vegetative propagules aid in the colonization of the island by means of wind and/or bird dispersal.

INTRODUCTION

Lord Howe Island, New South Wales, Australia is situated in the south-western Pacific Ocean between longitudes 159°02′12″ and 159°06′18″E and latitudes 31°30′42″ and 31°36′00″S. It lies approximately 1250 km north-west of the northern tip of New Zealand, 700 km north-east of Sydney and 800 km south-south-west of New Caledonia. The closest island is the Norfolk Island complex, at approximately 900 km north-north-east. Lord Howe Island is approximately 12 km long and 2.8 km wide, with two volcanic mountains in the south (Mt Gower at 875 m and Mt Lidgbird at 777 m), and low-lying hills in the north of the island. The island is believed to have become exposed about 7 million years ago (Archer & Elix, 1994) and sits on the western edge of the Lord Howe Rise which consists of a chain of undersea mountains (gyuots) (Archer & Elix, 1994; Green, 1994). These may have provided stepping stones linking the island to Australia, New Zealand and New Caledonia during the ice ages (Hutton, 1986). More detailed notes on the landforms, climate, vegetation and some previous lichenological endeavors on the island have been provided by Archer & Elix (1994).

MATERIALS AND METHODS

Primary thalline characters are believed to be most useful in distinguishing parmelioid genera as evolutionary development in the Parmeliaceae is considered to have occurred mainly in thalline morphology and anatomy, rather than in ascomata (Elix, 1993). Further, cortical substances in lichens are often correlated with higher taxonomic ranks, e.g. at generic or family level, and appear to have systematic significance due to their ecological roles (Elix, 1993). Medullary substances, on the other hand, are usually indicative of differences at the species level (Elix, 1993). As a result, specimens collected on Lord Howe Island were identified by morphological characters and chemistry. Throughout the present work chemical constituents were identified by thin layer chromatography (Culberson 1972; Culberson *et al.* 1981; Culberson & Johnson 1982; Elix & Ernst-Russell 1993; Elix *et al.* 1988), high performance liquid chromatography (Feige *et al.* 1993) and comparison with authenticated samples.

Examination of specimens collected by J.A. Elix and H. Streimann on Lord Howe Island in June 1992 and February 1995, and of specimens housed in the CANB herbarium, have resulted in the determination of 31 species in ten genera (Table 1).

RESULTS

The parmelioid genus best represented on the island is *Xanthoparmelia* (8 species). *Parmelia stramineonitens* Zahlbr. (a synonym of *Xanthoparmelia tasmanica* (Hook. f. & Taylor) Hale) was the only collection of Parmeliaceae recorded from a much earlier expedition to the island undertaken by Charles Moore (the then director of the Botanic Gardens in Sydney) and his assistant, Mr Carron in 1869. This species was described by A. Zahlbruckner in 1896 (Archer & Elix, 1994; Zahlbruckner 1896). In the present work two species, *Paraparmelia huttonii* Louwhoff & Elix and *Rimelia stictica* Louwhoff & Elix, are newly described. Keys to the genera and species follow, as well as descriptions of the species present on Lord Howe Island.

Key to Genera and Species of Parmeliaceae on Lord Howe Island

1 Upper surface brown or olive green, lacking atranorin, chloroatranorin and usnic acid.. ***Neofuscelia pulla***
1: Upper surface grey, grey-green or yellow-green, atranorin, chloroatranorin or usnic acid present.. 2

2 Upper surface yellow-green, usnic acid present, atranorin and chloroatranorin absent, upper cortex K-.................................... 3
2: Upper surface grey or grey-green, usnic acid absent, atranorin and chloroatranorin present, upper cortex K+ yellow 5

3 Lobes with bulbate cilia at margins............................. ***Relicina filsonii***
3: Lobes lacking bulbate cilia at margins 4

4 Lobe apices often incised, protocetraric acid absent... ***Xanthoparmelia***
4: Lobe apices not incised, protocetraric acid present...... ***Flavoparmelia***

5 Upper surface pseudocyphellate.. ***Parmelia***
5: Upper surface with or without maculae or cracks but not pseudocyphellate 6

6 Lobes eciliate.. 7
6: Lobes ciliate (cilia sparse or dense) 8

7 Lower surface erhizinate at margin, lobes broad (4-15 mm)....... ***Parmotrema***
7: Lower surface rhizinate to margin, lobes narrow (1-4 mm)....... ***Paraparmelia***

8 Marginal cilia bulbate at base.................................. ***Bulbothrix***
8: Marginal cilia not bulbate at base 9

9 Lobes narrow (less than 5 mm), triterpenes present ... ***Myelochroa aurulenta***
9: Lobes broad (5-15 mm), triterpenes absent **10**

10 Upper surface emaculate or, if maculate, maculae not effigurate nor forming reticulate cracks..................................... ***Parmotrema***
10: Upper surface effigurately maculate or with conspicuous reticulate cracks .... ***Rimelia***

Bulbothrix Hale

1. Medulla K-, salazinic acid and norstictic acid absent.............................. 2
1: Medulla K-, K+ yellow or yellow then red, norstictic acid or salazinic acid present... 3

2. Upper surface white maculate, medulla C-, gyrophoric acid absent .... ***B. queenslandica***
2: Upper surface emaculate, medulla C+ rose, gyrophoric acid present..... .... ***B. goebelii***

3. Medulla K+ yellow then red, salazinic acid present.................. ***B. tabacina***
3: Medulla K- or K+ yellow, norstictic acid present............ ***B. lordhowensis***

Flavoparmelia Hale

1 Thallus lacking dactyls, euplectin present in pigmented lower medulla................................ ***F. euplecta***
1: Thallus dactylate, euplectin absent, lower medulla only partly pigmented................................ ***F. haysomii***

Paraparmelia Elix & J.Johnst.

1. Thallus isidiate, salazinic acid present................................ ***P. murina***
1: Thallus non-isidiate, stictic acid present................................ ***P. huttonii***

Parmelia Ach.

1. Thallus esorediate................................ ***P.queenslandensis***
1: Thallus sorediate................................ ***P. erumpens***

Parmotrema A.Massal.

1: Thallus isidiate, at times becoming sorediate................................ 2
1. Thallus sorediate, lacking isidia................................ 3

  2. Isidia often ciliate, medulla K+ yellow, C-, stictic acid present................................ ***P. crinitum***
  2: Isidia never ciliate, medulla K-, C+ red, lecanoric acid present................................ ***P. tinctorum***

3. Medulla K+ yellow then red, salazinic acid present................................ ***P. cristiferum***
3. Medulla K- or K+ pale yellow/dirty brown, salazinic acid absent................................ 4

  4. Medulla P+ deep orange/red, protocetraric acid present................................ ***P. gardneri***
  4: Medulla P-, lecanoric acid present................................ 5

5. Saxicolous, lower surface with 3-4 mm wide, naked marginal zone................................ ***P. defectum***
5. Corticolous, lower surface with 5-10 mm wide, naked marginal zone................................ ***P. austrosinense***

Rimelia Hale & A.Fletcher

1. Thallus sorediate................................ ***R. reticulata***
1: Thallus esorediate................................ 2

  2. Upper surface rugulose, reticulate-cracked and flaking off................................ ***R. austrocetrata***
  2: Upper surface effigurately maculate or reticulate cracked but not flaking off................................ 3

3. Medulla K+ yellow then red, salazinic acid present................................ ***R. cetrata***
3: Medulla K+ yellow then orange, stictic acid present................................ ***R. stictica***

Xanthoparmelia Hale

1. Thallus isidiate 2
1: Thallus lacking isidia 8

2. Lower surface black 3
2: Lower surface pale or dark brown 4

3. Medulla K-, norlobaridone present .... ***X. thamnoides***
3: Medulla K+ yellow then deep red, salazinic acid present .... ***X. isidiigera***

4. Medulla K- 5
4: Medulla K+ yellow then red 7

5. Isidia with epicorticate apices 6
5: Isidia with syncorticate apices .... ***X. amplexula***

6. Medulla K-, exuviatic acid present .... ***X. exuviata***
6: Medulla K+ yellow then deep red, salazinic acid present 7

7. Isidia simple, up to 0.2 mm high .... ***X. consociata***
7: Isidia extensively branched, 0.5-3 mm high .... ***X. antleriformis***

8. Lower surface black, medulla K+ yellow then deep red.. ***X. tasmanica***
8: Lower surface pale or dark brown, medulla K-***X. flavescentireagens***

THE SPECIES

Bulbothrix goebelii (Zenker) Hale, *Smithsonian Contr. Bot.* 32: 14 (1976)

Parmelia goebelii Zenker in F.Goebel & G.Kunze, *Pharm. Waarenk.* 1: 134 (1827). *Type*: South America, *coll. unknown;* lecto: M, *fide* M.E. Hale, *loc. cit.*

Thallus tightly adnate, 2-8 cm wide. Lobes imbricate or not, sublinear-elongate, ±dichotomously branched, 0.5-1.5 mm wide; margins entire, at times appearing to be black-rimmed due to dense cilia; cilia bulbate, black or at times pale towards apices, apices ± branched. Upper surface pale grey or grey-green, flat, ±shiny, emaculate or faintly white-maculate, isidiate; isidia laminal, globose becoming cylindrical, occasionally branched, apices syncorticate. Medulla white. Lower surface black, pale towards margins, rhizinate; rhizines black or pale towards tips, squarrosely branched, dense. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow, medulla K-, C+ rose, KC+ red, P-; containing atranorin, chloroatranorin (minor), gyrophoric acid (major), ±methyl gyrophorate (trace), ±lecanoric acid (trace), ±unknown (trace).

Representative specimens examined (total 7): Lord Howe Island: Max Nicholls Track, 31°31′08″S, 159°03′03″E, 5 m, on tree in dry lowland forest with basalt outcrops, *J.A.Elix 32712*, 20 June 1992 (CANB); track to Goat House Cave at base of Mt Lidgbird escarpment, 31°33′48″S, 159°05′11″E, 380 m, on buttress roots, in moist, subtropical forest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42098*, 7 February 1995 (CANB); track from Smoking Tree Ridge to Rocky Run, 31°33′35″S, 159°05′09″E, 170 m, on dead palm in lowland forest on moderate slope, *J.A.Elix 42455*, 10 February 1995 (CANB).

On Lord Howe Island this species occurs in lowland forest, predominantly on palm trees, and in moist forest on root buttresses. In Australia, *B. goebelii* has also been reported on rock and bark in coastal rainforests in Queensland (Elix, 1994). *Bulbothrix goebelii* is considered a pantropical species of primary and secondary forests at low elevations in North, Central and South America, Africa, Thailand, Sabah, Indonesia, the Philippines, Papua New Guinea and Vanuatu (Elix, 1994).

Although a variable species, *B. goebelii* is characterized by the presence of isidia, branched rhizines and gyrophoric acid in the medulla.

Bulbothrix lordhowensis Elix, *Mycotaxon* 46: 231-232 (1995)

Type: Australia, New South Wales, Lord Howe Island, along track to Mutton Bird Point, 31°32′45″S, 159°05′E, 60 m, on dead canopy branches in dry lowland forest, *J.A.Elix 32781*, 21 June 1992; holo: CANB; iso: HO, MEL.

Thallus tightly adnate, 1-4 cm wide. Lobes subcontiguous to occasionally imbricate centrally, linear to sublinear-elongate, (0.3-)0.5-1.0 mm wide; margins with dense, black, bulbate, simple or forked cilia. Upper surface pale grey, plane to ±convex, becoming cracked with age, ±laciniate, moderately dense isidiate; isidia laminal, simple, less then 0.3 mm high, globose becoming cylindrical, apices syncorticate and black-tipped. Medulla white. Lower surface black, shiny, with moderate to dense, black, simple to dichotomously branched rhizines. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K- or K+ yellow, C-, P+ yellow-orange; containing atranorin, chloroatranorin, norstictic acid (major), two fluorescent unknowns (trace).

Specimens examined (total 3): Lord Howe Island: type location, on dead canopy branches, *J.A.Elix 32798*, 21 June 1992 (CANB); Neds Beach Road at Malabar Hill Track, 31°31′16″S, 159°03′50″E, 10 m, on *Cryptocarya*, *J.A.Elix 32860*, 22 June 1992 (CANB).

Bulbothrix lordhowensis appears to be endemic to Lord Howe Island, where it is uncommon on canopy branches of trees in lowland areas. Although morphologically similar to *B. queenslandica*, it is distinguished from this species by the presence of norstictic acid and two fluorescent unknowns in the medulla.

Bulbothrix queenslandica (Elix & G.N. Stevens) Elix, *Mycotaxon* 47: 126 (1993)

Parmelia queenslandica Elix & G.N. Stevens, *Austral. J. Bot.* 27: 873 (1979). *Type*: Australia, Queensland, Burleigh Heads National Park, Qld, 28 August 1975, *J.A. Elix 1145*; holo: MEL.

Thallus adnate, 1-4 cm wide. Lobes sublinear-elongate, di-trichotomously branched, 0.2-1.0 mm wide; margins entire, ciliate; cilia bulbate, black, shiny, dense, forming a thick black marginal rim, simple or branching at apices. Upper surface pale grey or grey-green, white-maculate, becoming cracked, particularly older lobes, isidiate; isidia laminal, globose becoming cylindrical, simple, apices syncorticate, blackened. Medulla white. Lower surface black with a pale brown marginal zone, rhizinate; rhizines black, simple to dichotomously branched, dense. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K-, C-, KC-, P-; containing atranorin and chloroatranorin.

Representative specimens examined (total 7): Lord Howe Island: near junction of tracks to Mutton Bird Point and Intermediate Hill, 31°32′43″S, 159°04′48″E, 60 m, on base of dead palm in dry lowland forest with basalt outcrops, *J.A.Elix 32748*, 21 June 1992 (CANB); Neds Beach Road at Malabar Hill Track, 31°31′16″S, 159°03′50″E, 10 m, on crown of *Cryptocarya* in disturbed lowland forest, *J.A.Elix 32868*, 22 June 1992 (CANB); track to Goat House Cave at base of Mt Lidgbird escarpment, 31°33′48″S, 159°05′11″E, 380 m, on palm in moist forest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42087*, 7 February 1995 (CANB); Soldiers Creek, 31°33′14″S, 159°04′48″E, 15 m, on *Pandanus* in disturbed lowland forest on stream flats, *J.A.Elix 42419*, 9 February 1995 (CANB).

On Lord Howe Island, this Australian endemic occurs most commonly in dry lowland forest, although one specimen was collected in a more dense, moist forest. In southern Queensland and New South Wales it is found on bark in coastal forests (Elix, 1994).

Bulbothrix queenslandica is characterized by its narrow lobes and the chemistry (only atranorin and chloroatranorin).

Bulbothrix tabacina (Mont. & v.d.Bosch) Hale, *Phytologia* 28: 481 (1974)

Parmelia tabacina Mont. & v.d.Bosch in J.P.F.C.Montagne, *Syll. Gen. Sp. Crypt.* 327 (1856) & in F.A.W.Miquel, *Pl. Jungh.* 4: 443 (1855 or 1857). *Type*: Java [Indonesia], *F.W.Junghuhn*; lecto: L; isolecto: PC, *fide* M.E.Hale, *Smithsonian Contr. Bot.* 32: 24 (1976).

Thallus adnate, to 4-7 cm wide. Lobes subirregular to sublinear, 1-3(-5) mm wide; margins ±crenate to entire, ciliate; cilia bulbate, black and shiny, short with inflated base, moderately dense. Upper surface pale grey, becoming ±brownish upon storage, cracked (particularly older lobes), isidiate; isidia simple, cylindrical, sparse to dense, apices syncorticate. Medulla white. Lower surface black with a brown naked or papillate zone along lobe margins, rhizinate; rhizines black, mostly simple to occasionally branched, moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ yellow then red, C-, P+ orange; containing atranorin, chloroatranorin, salazinic acid (major) and consalazinic acid (minor).

Specimens examined (total 2): Lord Howe Island: along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense, shrubby vegetation, *J.A.Elix 32899*, 23 June 1992 (CANB); Intermediate Hill via track to North Hummock, 31°32′45″S, 159°04′55″E, 120 m, growing on basalt rock in lowland forest with dense scrub cover on steep slope, *J.A.Elix 42017*, 5 February 1995 (CANB).

Although relatively common on the Australian mainland (Elix, 1994), only two specimens were found on Lord Howe Island. *Bulbothrix tabacina* is a pantropical species, found in coastal forests in Queensland, northern New South Wales and Norfolk Island; also common in open secondary forests in Central and South America, Africa, southern and south-east Asia and Papua New Guinea (Elix, 1994). The specimens from Lord Howe Island are saxicolous although this species is generally corticolous (Elix, 1994).

Bulbothrix tabacina is characterized by the broad lobes, the cylindrical isidia, the black lower surface and presence of salazinic acid in the medulla.

Flavoparmelia euplecta (Stirt.) Hale, *Mycotaxon* 25: 604 (1986)

Parmelia euplecta Stirt., *Scott. Naturalist (Perth)* 4: 299 (1877-1878); *Pseudoparmelia euplecta* (Stirt.) Hale, *Phytologia* 29: 190 (1974). *Type*: Australia, Queensland, near Brisbane, *F.M.Bailey 108*; lecto: BM, *fide* M.E.Hale, *Smithsonian Contr. Bot.* 31: 20 (1976).

Thallus adnate to loosely adnate, 3-4 cm wide. Lobes imbricate, irregular to sublinear, plane to undulating, occasionally lobulate, 2-5(-7) mm wide; with entire to crenulate margins, apices rotund. Upper surface yellow-green to (bright) green, ±faintly maculate, smooth to weakly rugulose centrally, dull, lacking dactyls and isidia, pustulate; pustules intact or erupting into soredia; soredia becoming corticate and granular, spreading laminally. Upper medulla white, lower medulla yellow/orange. Lower surface black, shiny, rhizinate; rhizines simple or tufted, sparse to moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K-, UV-; medulla K- or K+ pale yellowish, C-, P+ orange-red; pigmented lower medulla K+ purple; containing usnic acid (major), protocetraric acid (major), skyrin (minor), euplectin (minor), coneuplectin (minor), eumitrin K (minor).

Specimen examined: Lord Howe Island: between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks amongst large boulders, with scattered large *Ficus* and small shrubs and ferns, *J.A.Elix 42328*, 7 February 1995 (CANB).

Flavoparmelia euplecta is a common Australian endemic, occurring on rocks and trees in eastern Australia (Elix, 1994). A single specimen of *F. euplecta* was collected on Lord Howe Island.

Flavoparmelia euplecta is characterized by the sorediate pustules and the presence of the K+ purple pigment euplectin in the lower medulla. It is distinguished from the morphologically similar *F. haysomii* and *F. norfolkensis* Elix & Streimann by the lack of dactyls, and from *Flavoparmelia kantvilasii* Elix by the presence of the lower medullary pigment.

Flavoparmelia haysomii (C.W.Dodge) Hale, *Mycotaxon* 25: 605 (1986)

Parmelia haysomii C.W.Dodge, *Nova Hedwigia* 15: 295 (1968). *Type*: Macquarie Island, raised beach terrace south of Lusitania Bay, 23 March 1950, *N.M.Haysom Z136*; holo: FH; iso: MEL.

Thallus loosely adnate to adnate, 5-8(-15) cm wide. Lobes contiguous or becoming imbricate, irregular to sublinear, 1-3(-5) mm wide; margins mostly entire, occasionally ±crenulate, eciliate, apices rotund. Upper surface straw-yellow to yellow-green, broadly undulating, rugose, maculate, with laminal dactyls; dactyls moderately dense to dense, short, wide and ±robust initially, becoming tall and (sparingly) branched, often apically erumpent and developing granular soredia. Medulla white throughout or lower medulla yellow in patches. Lower surface black and shiny, wrinkled, rhizinate with a thin, pale, erhizinate zone at lobe margin; rhizines black, sparse, simple, slender. Apothecia and pycnidia not seen.

Chemistry: cortex K-, UV-; medulla K-, C-, KC-, P+ orange-red; pigmented lower medulla K+ purple; containing usnic acid (major), protocetraric acid (major), methyl protocetrarate (minor), virensic acid (minor), ±eumitrin K , ±skyrin.

Representative specimens examined (total 10): Lord Howe Island: Max Nicholls Track, 31°31′08″S, 159°03′03″E, 50 m, on dead log in dry lowland forest with basalt outcrops, *J.A.Elix 32719*, 20 June 1992 (CANB); track to Little Island, near Salmon Beach, 31°33′30″S, 159°04′30″E, 5 m, on basalt rocks in scrubby, partly disturbed lowland forest, *J.A.Elix 32699*, 20 June 1992 (CANB); between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, growing on basalt rocks amongst large boulders with scattered *Ficus*, small shrubs and ferns, *J.A.Elix 42292*, 7 February 1995 (CANB).

This very common saxicolous species also occurs in the cooler areas of southern Australia, New Zealand and Macquarie Island (Elix, 1994). On Lord Howe Island, *Flavoparmelia haysomii* occurs most commonly on basalt rocks in dense, shrubby vegetation although one specimen was collected from a dead log in dry lowland forest.

Flavoparmelia haysomii is characterized by the presence of protocetraric acid and the laminal dactyls which only rarely burst open to form soredia (Elix, 1994). However, many of the specimens examined on Lord Howe Island displayed heavily sorediate or pustulate dactyls.

Myelochroa aurulenta (Tuck.) Elix & Hale, *Mycotaxon* 29: 240 (1987)

Parmelia aurulenta Tuck., *Amer. J. Sci. Arts*, ser. 2, 25: 424 (1858); *Parmelina aurulenta* (Tuck.) Hale, *Phytologia* 28: 482 (1974); *Hypotrachyna aurulenta* (Tuck.) Krog & Swinscow, *Lichenologist* 19: 420 (1987). *Type*: United States of America, Virginia, Harpers Ferry, *E.Tuckerman*; lecto: FH-TUCK, *fide* M.E.Hale, *Smithsonian Contr. Bot.* 33: 19 (1976).

Thallus loosely adnate to adnate, 4-10 cm wide. Lobes contiguous to becoming imbricate, subirregular to sublinear, 2-4 mm wide, older lobes centrally contorted, apices subrotund; margins sparsely ciliate; cilia concentrated in the lobe axils, otherwise irregularly dispersed, sparse, short. Upper surface pale grey-green, at times with a ±bluish hue, smooth to rugulose, sorediate to pustulate-sorediate; pustules and soredia laminal, moderately dense to dense, some soredia coalescing into large, subcapitate clumps. Medulla white, becoming sulfur-yellow beneath soredia, pustules and cracks in the upper cortex. Lower surface black, rhizinate, with a pale, narrow papillate zone at lobe margin; rhizines black, simple or becoming sparsely furcate or squarrosely branched, moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K-, C-, KC-, P-; containing atranorin, chloroatranorin, ±secalonic acid A, zeorin, leucotylic acid, ±unidentified pigments.

Representative specimens examined (total 6): Lord Howe Island: along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense, shrubby vegetation, *J.A.Elix 32897*, 23 June 1992 (CANB); Goat House Cave at base of Mt Lidgbird escarpment, 31°33′50″S, 159°05′15″E, 420 m, growing on basalt in moist rainforest with *Dracophyllum* and *Cyathea*, *J.A.Elix 4222*, 7 February 1995 (CANB); between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks amongst large boulders, with scattered large *Ficus*, small shrubs and ferns, *J.A.Elix 42320*, 7 February 1995 (CANB).

Myelochroa aurulenta has a scattered distribution in coastal and hinterland forests of eastern Australia and on all other continents except Europe (Elix, 1994). It reportedly grows on bark and, rarely, on rock (Elix, 1994). On Lord Howe Island, however, almost all specimens were collected on rock in dense, shrubby vegetation or on boulders in moist rainforest.

This species, and indeed the genus as a whole, is characterized by the presence of hopane triterpenes in the medulla. In addition, *M. aurulenta* has soredia which range from densely pustulate to forming well-developed soralia which obscure most of the initial pustules and often large parts of the thallus. Sulfur-yellow to orange medullary patches are present below the soredia.

Neofuscelia pulla (Ach.) Essl., *Mycotaxon* 7: 52 (1978)

Parmelia pulla Ach., *Syn. Meth. Lich.*: 206 (1814). *Type*: Sweden, *coll. unknown*; lecto: H-ACH, *fide* T.L.Esslinger & T.Ahti, *Revista Fac. Ci. Univ. Lisboa, Sér. 2, C, Ci. Nat.* 17: 635 (1975).

Thallus adnate, 2-5 cm wide. Lobes discrete to imbricate or becoming contorted-entangled, particularly in the central lobes, subirregular to sublinear, 0.5-1.5 mm wide; margins ±subascending, eciliate, apices subrotund to ±crenulate, occasionally incised. Upper surface green-brown or yellowish brown to reddish dark brown, ±shiny, smooth to moderately rugose, plane to ±subconvex, faintly maculate in places, lacking isidia or soredia. Medulla white. Lower surface dark brown to black, paler at lobe margin, rhizinate; rhizines black, simple, rarely becoming fasciculate, moderately dense. Apothecia not seen. Pycnidia common. Conidia bifusiform or, occasionally, fusiform, 4-7 x 1 µm.

Chemistry: cortex K-; medulla K-, C-, KC-, P-, UV-; containing divaricatic acid. In other areas this species may also contain stenosporic acid and accessory perlatolic acid, gyrophoric acid (C+ rose, KC+ rose) and unidentified compounds (Elix, 1994).

Representative specimen examined (total 2): Lord Howe Island, along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense shrubby vegetation, *J.A.Elix 32970*, 23 June 1992 (CANB).

Neofuscelia pulla is a common and variable species in Australia, Europe, northern and southern Africa and New Zealand (Elix, 1994). On Lord Howe Island both specimens were collected from basalt rock, in dense, shrubby vegetation.

Neofuscelia pulla is characterized by its variable morphology, black lower surface, lack of isidia and the presence of divaricatic or stenosporic acid in the medulla.

Paraparmelia huttonii Louwhoff & Elix, sp. nov. Figure 1

Species cum thallo ut in *Paraparmelia xanthomelanoides* sed ab hac specie thallo laxiore adnate, lobis latioribus et acido peristictico continente differt.

Type: Australia, New South Wales, Lord Howe Island, between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks, amongst large boulders with scattered large *Ficus*, small shrubs and ferns, *J.A.Elix 42285*, 7 February 1995 (CANB).

Thallus adnate, 2-4 cm wide. Lobes contiguous or becoming imbricate, sublinear to sublinear-elongate, irregularly branched, 1-2 mm wide; margins entire to crenate, ±laciniate, apices ±incised to rotund, eciliate. Upper surface pale grey to grey, apices brown at margins, dull centrally, shiny towards the apices, smooth, lacking isidia or soredia. Medulla white. Lower surface black, shiny, smooth, rhizinate; rhizines black, simple to sparsely branched, sparse to moderately dense. Apothecia not seen. Pycnidia immersed, scattered. Conidia bifusiform, 5.5-9 x 1-1.3 µm.

Chemistry: cortex K+ yellow, medulla K+ yellow, C-, P+ orange/pale red; containing atranorin (minor), stictic acid (major), constictic acid (minor), cryptostictic acid (trace), peristictic acid (trace), norstictic acid (trace).

Paraparmelia huttonii is known only from the type collection, on basalt rocks in subtropical rainforest.

This new species is characterized by the medullary chemistry, the black lower surface and the absence of isidia. Only two other species of *Paraparmelia*, *P. xanthomelanoides* Nash & Elix and *P. asilaris* (Brusse) Elix, contain stictic acid and lack isidia. *Paraparmelia huttonii* is less tightly adnate than *P. xanthomelanoides* and has significantly broader lobes (1-2 mm *cf.* 0.2-1.0 mm wide). *Paraparmelia asilaris* exhibits a much broader variation in lobe width (0.5-3.5 mm *cf.* 1-2 mm wide) and differs chemically from *P. huttonii* in containing additional butlerin G (submajor) and hypostictic acid (minor) in the medulla. This species is named in honour of the Australian naturalist, Mr. Ian Hutton, well known for his work and publications on Lord Howe Island.

Paraparmelia murina (Kurok.) Elix & J.Johnst., in J. A. Elix, J. Johnston & D. Verdon, *Mycotaxon* 27: 280 (1986)

Parmelia murina Kurok., *Bull. Natl Sci. Mus. Tokyo*, ser B, 11: 85 (1985). *Type*: Australia, New South Wales, just N of Reedy Ck bridge, Windsor to Singleton Road, 27 October 1965, *S.Kurokawa 5129*; holo: TNS; iso: MEL.

Thallus tightly adnate to adnate, 3-6(-9) cm wide. Lobes discrete to subcontiguous, becoming crowded and contorted centrally, subirregular to sublinear, irregularly branched, 1-2(-3) mm wide, rarely becoming laciniate in centre; margins often black-rimmed rarely incised, eciliate, apices subrotund. Upper surface pale grey to dark grey, dull, ±shiny towards apices, emaculate but with conspicuous cracks in the upper cortex, particularly on older lobes, rarely areolate centrally, isidiate; isidia laminal, moderately dense to dense, globose then cylindrical and often coralloid-branched, apices syncorticate, blackened. Medulla white. Lower surface black, rhizinate; rhizines black, simple, moderately dense. Apothecia and pycnidia not seen.

Chemistry: K+ yellow; medulla K+ yellow then dark red, C-, P+ intense yellow; containing atranorin, salazinic acid (major), ±consalazinic acid (minor), ±norstictic acid (trace).

Representative specimens examined (total 6): Lord Howe Island: along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense vegetation, *J.A.Elix 32964*, 23 June 1992 (CANB); Mt Eliza, 31°30′52″S, 159°02′20″E, 130 m, on exposed boulder amongst exposed rocks faces in steeply sloping south-eastern grasslands, *H.Streimann 55791*, 6 February 1995 (CANB); Kims Lookout, 31°30′59″S, 159°03′12″E, 180 m, on exposed boulder, in sparse heathy vegetation at edge of stunted lowland forest, *H.Streimann 55740*, 6 February 1995 (CANB).

Paraparmelia murina is a common species in southern and eastern Australia, as well as in New Zealand (Elix, 1994). On Lord Howe Island it occurs on basalt outcrops in dense, shrubby vegetation.

The species is characterized by the laminal, coralloid isidia, the black lower surface and the presence of salazinic acid in the medulla.

Parmelia erumpens Kurok., *Lichenes Rar. Crit. Exsicc. (Tokyo)* No. 74 (1969)

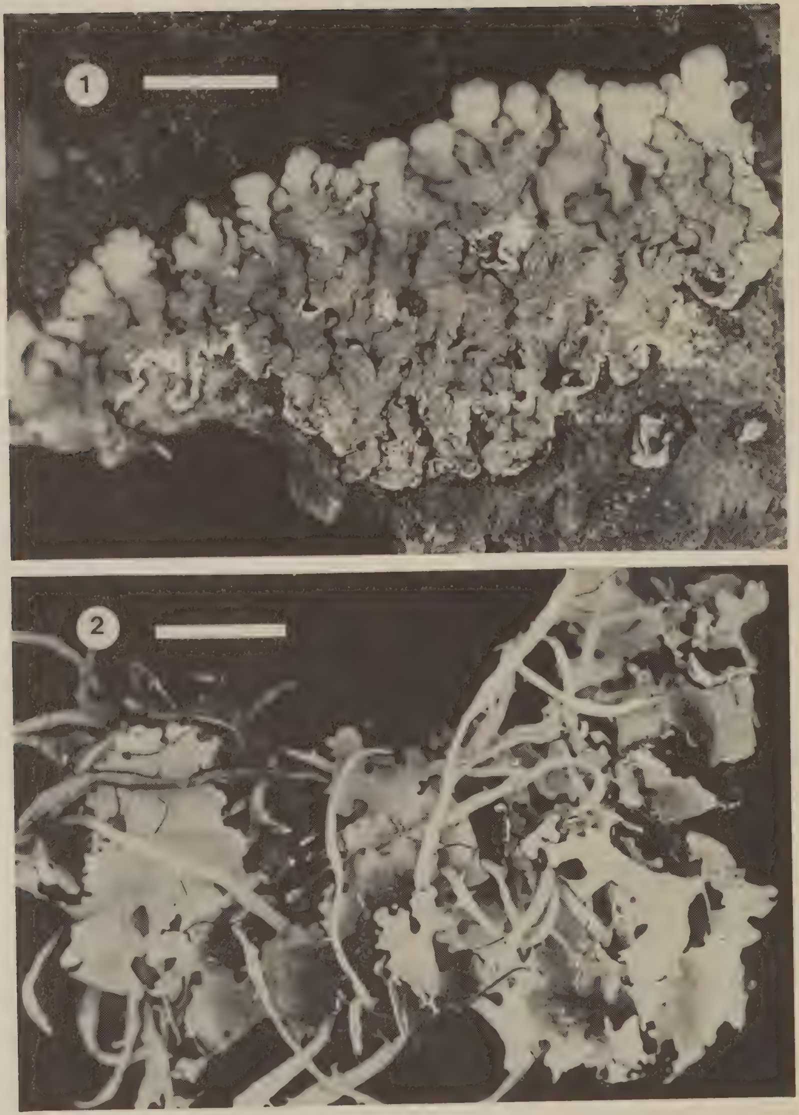
Based on *Parmelia tenuirima* f. *corallina* Müll.Arg., *Flora* 66: 46 (1888). *Type*: Australia, Victoria, Gippsland, Mitchell River, *C.Ross s.n.*; lecto: G; isolecto: PC, *fide* D.J.Galloway & J.A.Elix, *New Zealand J. Bot.* 21: 401 (1983).

Thallus moderately to loosely adnate, 5-15(-20) cm wide. Lobes contiguous to imbricate or becoming congested and contorted centrally, subirregular to sublinear, irregularly branched (1-)3-5(-8) mm wide; margins flat to subascending, apices subrotund to crenulate or ±incised. Upper surface pale grey-green, smooth to ±rugose, shiny and occasionally becoming distinctly pruinose at lobe tips, effigurately white-maculate to reticulate-cracked and pseudocyphellate, sorediate; pseudocyphellae forming a reticulate pattern on the upper surface, somewhat raised, dense; dactyls arising from pseudocyphellae, becoming erumpent; soredia laminal, arising from cracks in the upper cortex and from dactyls on pseudocyphellae, initially granular but coalescing into coarse, partly corticate, dense clumps which sometimes develop into coralloid-isidioid outgrowths. Medulla white. Lower surface black, rhizinate; rhizines black, thick and simple or thin and squarrosely-branched, moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ yellow then dark red, C-, P+ red-orange; containing atranorin, chloroatranorin, salazinic acid (major), consalazinic acid (minor), ±gyrophoric acid.

Representative specimens examined (total 13): Lord Howe Island: along track to Mutton Bird Point, 31°32′45″S, 159°05′00″, 60 m, on dead canopy branches in dry lowland forest with basalt outcrops, *J.A.Elix 32780*, 21 June 1992 (CANB); Goat House Cave at the base of Mt Lidgbird escarpment, 31°33′50″S, 159°05′15″E, 420 m, on basalt in moist rainforest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42220*, 7 February 1995 (CANB); between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rock, amongst large boulders with scattered, large *Ficus* and small shrubs and ferns, *J.A.Elix 42337*, 7 February 1995 (CANB).

Parmelia erumpens is a very common species in southern Australia, but is uncommon in New Zealand and Norfolk Island. This species is also



Figures 1-2. New species of Parmeliaceae: 1, *Paraparmelia huttonii* (part of holotype); 2, *Rimelia stictica* (part of holotype, intertwined with *Heterodermia leucomelos* ssp. *boryi* (Fée) Swinsc. & Krog). Scale bar = 5 mm.

known from South Africa and southern and eastern Asia (Elix, 1994). On Lord Howe Island it is common in dry, lowland forest and moist rainforest, growing on basalt rocks or on dead canopy branches and trunks of trees.

Parmelia erumpens is a variable species, but is characterized by the deeply reticulate cracks in the upper surface which develop granular soredia on coarse isidioid clumps.

Parmelia queenslandensis Hale, *Smithsonian Contr. Bot.* 66: 36 (1987)

Type: Australia, Queensland, Bunya Mountains National Park, near the north exit, *M.E.Hale 65970*; holo: US; iso: BM, MEL.

Thallus adnate, 2-5(-8) cm wide. Lobes contiguous to becoming imbricate, subirregular to sublinear-elongate, 1.5-3 mm wide; margins entire to weakly crenulate or occasionally ±incised, eciliate. Upper surface pale grey to grey-green, shiny, white-maculate at lateral lobes and lobe tips, smooth, becoming cracked and pseudocyphellate on central, older lobes; lacking isidia or soredia; pseudocyphellae effigurate, becoming somewhat raised, covering entire upper surface. Medulla white. Lower surface black, shiny, smooth, usually rhizinate to margins, or with a thin erhizinate to weakly papillate zone at lobe margins; rhizines black, short, 0.5-1.0 mm, coarse, simple to occasionally becoming squarrosely branched, moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ yellow then dark red, C-, P+ deep orange; containing atranorin, chloroatranorin, salazinic acid (major) and consalazinic acid (minor).

Specimens examined (total 2): Lord Howe Island: track to Goat House Cave at base of Mt Lidgbird escarpment, 31°33′48″S, 159°05′11″E, 380 m, growing on a dead log, in moist forest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42090*, 7 February 1995 (CANB); Soldiers Creek, 31°33′14″S, 159°04′48″E, 15 m, growing on *Pandanus* in disturbed lowland forest on stream flats, *J.A.Elix 42418*, 9 February 1995 (CANB).

Parmelia queenslandensis occurs in eastern Australia where it occurs scattered on canopy branches of rainforest trees in montane areas (Elix, 1994). On Lord Howe Island this species grows on living or dead trees, in dense or disturbed lowland forest.

Parmelia queenslandensis is morphologically and chemically similar to *P. erumpens*, but the lobes are more linear, regular and lack soredia. The two specimens collected from Lord Howe Island have thinner lobes than reported previously (Elix, 1994) and lack apothecia and pycnidia.

Parmotrema austrosinense (Zahlbr.) Hale, *Phytologia*, 28: 335 (1974)

Parmelia austrosinensis Zahlbr. In H.Handel-Mazzetti, *Symb. Sin.* 3: 192 (1930). *Type*: China, Kweitschou, Gwanyinschan, near Kweiyang, 6 July 1917, *H.Handel-Mazzetti 10580*; lecto: WU; isolecto: BPI, W, *n.v.*, *fide* M.E.Hale, *Contr. U.S. Natl Herb.* 36: 239 (1965).

Thallus loosely adnate, coriaceous, 5-15 cm wide. Lobes irregular, rounded, 6-15 mm wide; margins eciliate, revolute and sinuate, usually ascending, with entire or sometimes crenulate margins. Upper surface ash-grey to grey-green, smooth to ±rugulose, cortex rarely emaculate or becoming cracked, sorediate; soralia mainly restricted to thickened, sinuate lobe margins; soredia farinose, becoming granular, occasionally spreading over the upper surface. Medulla white. Lower surface black, rhizinate, with a broad (5-10 mm wide), brown, erhizinate zone at lobe margins; rhizines black, paler towards lobe margins, mostly simple, sparse to occasionally moderately dense. Apothecia not seen. Pycnidia uncommon to relatively common, marginal. Conidia filiform, 13-15 x 1 µm.

Chemistry: cortex K+ yellow; medulla K-, C+ red, KC+ red, P-; containing atranorin, chloroatranorin and lecanoric acid.

Specimens examined (total 2): Lord Howe Island: Neds Beach Road at Malabar Hill Track, 31°31′16″S, 159°03′50″S, 10m, on *Cryptocarya* in disturbed lowland forest, *J.A.Elix 32859*, 22 June 1992 (CANB); escarpment between Neds Beach and Searles Point, 31°30′12″S, 159°04′05″E, 20 m, on *Cryptocarya* in poor lowland forest on sandy calcareous soil, *J.A.Elix 42007*, 5 February 1995 (CANB).

Parmotrema austrosinense is a widespread species in temperate and tropical regions of the world. In Australia, this species commonly occurs on bark of trees and, rarely, on rock in moist subtropical and tropical Queensland (Elix, 1994). On Lord Howe Island, *P. austrosinense* was collected on bark of trees in disturbed lowland forest.

The species is characterized by the large, loosely adnate thallus, the distinctly sinuate, ascending, sorediate lobe margins and the presence of lecanoric acid in the medulla.

Parmotrema crinitum (Ach.) M.Choisy, *Bull. Mens. Soc. Linn. Soc. Bot. Lyon* 21: 175 (1952)

Parmelia crinita Ach., *Syn. Meth. Lich.*: 196 (1814). *Type*: North America, *G.H.E.Muhlenberg s.n.*; holo: H, *n.v.*, *fide* M.E.Hale, *Contr. U.S. Natl Herb.* 36: 284 (1965).

Thallus adnate to loosely adnate, coriaceous, 5-10 cm wide. Lobes subirregular, imbricate or not, 4-10(-20) mm wide; margins denticulate or irregularly incised, rarely ±lobulate, sinuate (particularly the central lobes), sparsely to occasionally densely ciliate, cilia simple or sparingly branched. Upper surface ash-grey or grey-green, ±shiny, smooth to rugose and often developing cracks, rarely maculate, isidiate; isidia laminal or marginal, short cylindrical to becoming coralloid-branched, often growing in small clumps, sparse to dense, often brown-tipped, occasionally dissolving into soredia, often ciliate at apices. Medulla white. Lower surface black, rhizinate, with a thin, brown, erhizinate zone at lobe margin; rhizines black, slender, simple, dense, to 1 mm long. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ yellow, C-, P+ orange, UV-; containing atranorin, chloroatranorin, stictic acid (major), constictic acid (minor), cryptostictic acid, (trace), ±peristictic acid (trace), ±menegazziaic acid (trace), ±norstictic acid (trace), ±hypostictic acid (trace).

Representative specimens examined (total 29): Lord Howe Island; Max Nicholls Track, 31°31′08″S, 159°03′03″E, 50 m, on basalt rocks in dry lowland forest, *J.A.Elix 32726*, 20 June 1992 (CANB); ridge East of Malabar Hill, 31°30′51″S, 159°03′40″E, 180 m, on tree trunk, on open exposed heathy area on ridge above cliffs, *H. Streimann 50104*, 23 June 1992 (CANB); between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks amongst large boulders with scattered large *Ficus*, small shrubs and ferns, *J.A.Elix 42313*, 7 February 1995 (CANB); Goat House Cave at the base of Mt Lidgbird escarpment, 31°33′50″S, 159°05′15″E, 420 m, on treelet in moist rainforest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42276*, 7 February 1995 (CANB).

Parmotrema crinitum is a cosmopolitan species, widespread in temperate and tropical regions (Elix, 1994). It is common in coastal areas of eastern Australia, where it grows on bark and rock (Elix, 1994), and on Norfolk Island (Elix & Streimann, 1989). On Lord Howe Island *P. crinitum* is the most commonly collected *Parmotrema* species, occurring on both bark and rocks in dry lowland forest, moist rainforest or in open heathy areas.

Parmotrema crinitum is characterized by the dense, abundant isidia which are often ciliate at the apices (or rarely become sorediate), and the presence of the stictic acid chemosyndrome in the medulla.

Parmotrema cristiferum (Taylor) Hale, *Phytologia* 28: 335 (1974)

Parmelia cristifera Taylor, *London J. Bot.* 6: 165 (1847). *Type*: Calcutta [India], *N.Wallich*; lecto: FH; isolecto: BM, *fide* M.E.Hale, *Contr. U.S. Natl Herb.* 36: 241 (1965).

Thallus loosely adnate, coriaceous, (3-)8-15 cm wide. Lobes imbricate or subascending at margins, irregular, 6-20 mm wide; margins entire or crenate, sinuate, occasionally incised, eciliate or lobe axils ±sparsely ciliate. Upper surface pale grey-green, ±faintly maculate, smooth to becoming ±reticulately cracked in places, sorediate; soralia marginal, developing into granular soredia which often appear subcapitate on ±ascending lobe tips. Medulla white. Lower surface black, smooth, rhizinate, with a broad, brown, shiny, erhizinate zone at lobe margin; rhizines sparse, short, simple, black, paler towards margins. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ yellow then dark red, C-, P+ orange-red; containing atranorin, chloroatranorin, salazinic acid (major), ±consalazinic acid (minor).

Representative specimens examined (total 5): Lord Howe Island: along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense, shrubby vegetation, *J.A.Elix 32908*, 23 June 1992 (CANB); junction of Kims lookout and Max Nicholls tracks, 31°31′08″S, 159°03′01″E, 100 m, on basalt rocks in lowland forest on flat broad ridge, *J.A.Elix 42052*, 6 February 1995 (CANB); track to Goat House Cave at the base of Mt Lidgbird escarpment, 31°33′48″S, 159°05′11″E, 380 m, growing on basalt rocks in moist forest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42103*, 7 February 1995 (CANB); track to Kims Lookout, 31°30′59″S, 159°03′12″E, 180 m, on branch of tree in stunted lowland forest, *J.A.Elix 42382*, 9 February 1995 (CANB).

Parmotrema cristiferum is a cosmopolitan species which is widespread in tropical and subtropical areas (Elix, 1994). In Australasia this species is common in coastal and hinterland areas of eastern Australia and also occurs on Norfolk Island (Elix & Streimann, 1989). On Lord Howe Island *P. cristiferum* occurs primarily on basalt rocks in dense, shrubby vegetation, moist rainforest and in lowland forest.

This species is characterized by the broad, ascending, marginally sorediate lobes and the presence of salazinic acid in the medulla.

Parmotrema defectum (Hale) Hale, *Phytologia* 28, 335 (1974)

Parmelia defecta Hale, *Contr. U.S. Natl. Herb.* 36: 244-245 (1965). *Type*: South Africa, Natal, Bergville, Cathedral Park area, 3 November 1953, *O.Almborn* 8934; holo: LU.

Thallus loosely adnate to adnate, coriaceous, 5-10 cm wide. Lobes imbricate to centrally contorted, irregular to sublinear, rounded, (3-)5-10 mm wide; margins subascending, sinuate, entire to jagged or ±incised, eciliate. Upper surface pale grey or pale grey-brown, dull, smooth at first then becoming rugose and developing cracks centrally, sorediate; soralia marginal to subcapitate or subpustulate; developing into granular soredia. Medulla white. Lower surface black, rhizinate with a naked, brown zone at lobe margin, 3-4 mm wide; rhizines black, simple, sparse to moderately dense. Apothecia not seen. Pycnidia laminal at lobe margins, sparse. Conidia filiform, 14-17 x 1-1.5 μm.

Chemistry: cortex K+ yellow; medulla K-, C+ red, P-; containing atranorin, chloroatranorin, lecanoric acid (major) and trace unknowns.

Representative specimens examined (total 2): Lord Howe Island: Far NW coast, on basalt, *J.H.Willis*, 30 August 1981 (MEL 1045439); far NW coast, on basalt, *J.H.Willis*, 30 August 1981 (MEL 1045443).

Parmotrema defectum is a saxicolous species, previously reported from East and South Africa (Hale, 1965). On Lord Howe Island it was collected on exposed basalt outcrops.

This species is similar to *P. austrosinense* but lacks the prominent, ascending lobe margins and has a thinner, naked marginal zone on the lower surface, 3-4(-5) mm wide (*cf.* 5-10 mm wide). Furthermore, *P. austrosinense* has broader lobes (6-30 mm *cf.* 3-10 mm wide) and is less tightly adnate. Pycnidia were observed on specimens collected on Lord Howe Island, although they were not reported previously from the African specimens (Hale, 1965).

Parmotrema gardneri (C.W.Dodge) Sérus., *Bryologist* 87: 5 (1984)

Parmelia gardneri C.W.Dodge, *Ann. Missouri Bot. Gard.* 46: 179 (1959). Type: Brazil, *G.Gardner s.n.*; holo: FH.

Thallus adnate to loosely adnate, coriaceous, 4-7 cm wide. Lobes imbricate or not, rounded, subirregular to sublinear, irregularly branched, 4-8(-15) mm wide; margins flat to subascending, ±sinuate, crenulate or ±incised, eciliate (or rarely sparsely ciliate), sublaciniate or not. Upper surface pale grey-green, rugose or occasionally cracked centrally, smooth towards lobe apices, emaculate, sorediate; soralia mostly marginal on revolute lobes and becoming subcapitate, developing into granular soredia which may spread submarginally. Medulla white. Lower surface rugose, black, with a brown erhizinate zone; rhizines black, simple, short and occasionally almost papillate, sparse. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ pale yellow, C-, P+ deep orange or red; containing atranorin, chloroatranorin and protocetraric acid (major).

Specimen examined: Lord Howe Island: ridge to Malabar Hill, 31°31′12″S, 159°03′39″E, 90 m, on rotting treelet branch in dense, shrubby vegetation on rocky (basalt) ridge, *H.Streimann 50027*, 23 June 1992 (CANB).

Parmotrema gardneri is a pantropical species known from Australia, Africa, South America and Papua New Guinea (Elix, 1994). In Australia this species has been reported on bark of trees in Queensland and is also known from Norfolk Island (Elix & Streimann, 1989).

Parmotrema gardneri is characterized by the adnate thallus with loosely adnate, eciliate, subascending lobe margins, marginal to subcapitate soralia which may spread submarginally and the presence of protocetraric acid in the medulla.

Parmotrema tinctorum (Despr. ex Nyl.) Hale, *Phytologia* 28: 339 (1974)

Parmelia tinctoria Despr. Ex Nyl., *Flora* 55: 547 (1872). *Type*: Canary Islands, *J.M.Despréaux;* holo: H-NYL 35365, *n.v.*, *fide* M.E.Hale, *Contr. U.S. Natl Herb.* 36: 264 (1965).

Thallus loosely adnate, coriaceous, 5-12(-30) cm wide. Lobes imbricate or not, irregular, (5-)10-20 cm wide; margins entire to crenate or weakly incised, sinuate to subascending, eciliate. Upper surface pale grey to grey-green, ±shiny but dull towards thallus centre, emaculate, cortex occasionally becoming reticulate-cracked and flaking, isidiate; isidia laminal to occasionally marginal, primarily on central lobes, sparse to abundant, mostly simple but occasionally branched, cylindrical to irregularly inflated, brown-tipped or concolorous, rarely dissolving into granular soredia. Medulla white. Lower surface black, smooth, shiny, rhizinate with broad, brown, erhizinate zone at lobe margin; rhizines black, sparse, simple, short and thick. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K-, C+ red, KC+ red, P-; containing atranorin, chloroatranorin, lecanoric acid (major).

Representative specimens examined (total 13): Lord Howe Island: along track to Mutton Bird Point, 31°32′45″S, 159°05′00″E, 60 m, on dead canopy branches in dry lowland forest with basalt outcrops, *J.A.Elix 32778*, 21 June 1992 (CANB); along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense, shrubby vegetation, *J.A.Elix 32921*, 23 June 1992 (CANB); Mt Eliza, 31°30′52″S, 159°02′20″E, 130 m, on boulder amongst exposed rock faces in steeply sloping grasslands, *H.Streimann 55786*, 6 February 1995 (CANB).

Parmotrema tinctorum is a cosmopolitan species which is widespread throughout tropical and temperate regions of the world including North, Central and South America, Africa, southern and eastern Asia, Indonesia, Australia and on many islands in the South Pacific (Elix, 1994). On Lord Howe Island *P. tinctorum* occurs on basalt rocks and bark of dead and living trees, in dry (disturbed) lowland forest, exposed grasslands or in heathy vegetation.

Parmotrema tinctorum is characterized by the large, loosely attached thallus, the isidiate upper surface, the eciliate lobes with crenate, sinuate to subascending margins and the presence of lecanoric acid in the medulla.

Relicina filsonii Elix & J.Johnst., *Mycotaxon* 27: 615 (1986)

Type: Australia, New South Wales, Gloucester Tops, Kerripit River, 15 January 1969, *R.B.Filson 11174;* holo: MEL.

Thallus adnate to loosely adnate, 3-5(-8) cm wide. Lobes rarely imbricate, irregular to sublinear-elongate, becoming twisted and contorted centrally, separate at periphery, 1-2(-3) mm wide, densely ciliate; cilia bulbate, black, slender or short and thick, 0.2-1(-2) mm long, conspicuous. Upper surface yellow-green, flat to weakly convex, dull, becoming shiny at lobe apices, smooth to weakly rugulose centrally, rarely weakly maculate. Medulla white. Lower surface very pale to dark brown, shiny, densely rhizinate to the margins; rhizines thick and blackened at base, becoming pale and slender towards apices, predominantly simple, occasionally dichotomously branched or entangled. Apothecia common, immature, to 1 mm wide; disc ±flat or shallowly concave, cinnamon-brown; thalline exciple ecoronate, retrorsely rhizinate; no mature ascospores seen. Pycnidia common and abundant, punctiform. Conidia bifusiform, 6-7 x 1 µm.

Chemistry: cortex K-, UV-, medulla K+ yellow then dark red, C-, P+ orange; containing usnic acid, norstictic acid (major), connorstictic acid (minor), hyposalazininc acid (trace), unknown (trace).

Representative specimens examined (total 5): Lord Howe Island: along track to Mutton Bird Point, 31°32′45″S, 159°05′00″E, 60 m, on dead canopy branches in dry lowland forest with basalt outcrops, *J.A.Elix 32777*, 21 June 1992 (CANB); along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on *Ficus* in dense shrubby vegetation with basalt outcrops, *J.A.Elix 32938*, 23 June 1992 (CANB).

Relicina filsonii is a rare Australian endemic which grows on bark and canopy branches of trees in temperate, coastal forests of central and southern New South Wales (Elix, 1994). On Lord Howe Island, the species occurs on trees in dense, shrubby vegetation or on canopy branches in dry, lowland forest.

Relicina filsonii is characterized by its medullary chemistry, the pale lower surface and lack of isidia. Although mature apothecia were not observed in specimens collected on Lord Howe Island, pycnidia were abundant.

Rimelia austrocetrata (Elix & J.Johnst.) Hale & A.Fletcher, *Bryologist* 93: 26 (1990)

Parmotrema austrocetratum Elix & J.Johnst., *Mycotaxon* 31: 495 (1988). *Type*: New Zealand, North Island, New Plymouth, Burgess Park, 7 May 1980, *J.A.Elix 4645*; holo: CHR; iso: CANB.

Thallus loosely adnate, coriaceous, 6-15 cm wide. Lobes contiguous becoming imbricate, subirregular to sublinear-elongate, apically rotund, 8-15(-30) mm wide; margins entire to weakly crenulate, often sinuate or ±ascending, laciniate or not, ciliate; cilia moderately dense, black, simple and slender. Upper surface pale grey-green, rugulose, conspicuously white-reticulate, cracked and often becoming areolate; areolae flaking off and revealing white medulla, with dactyls; dactyls inconspicuous, laminal, closed or apically split, raised and fused to form laminal ridges. Lower surface black, weakly rugulose, rhizinate; rhizines dense, black, slender, simple or sparsely squarrosely-branched. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow, medulla K+ yellow then red, C-, P+ red-orange; containing atranorin, chloroatranorin, salazinic acid (major), consalazinic acid (minor), ±norstictic acid (trace).

Representative specimens examined (total 5): Lord Howe Island, between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks amongst large boulders with scattered large *Ficus*, small shrubs and ferns, *J.A.Elix 42338*, 7 February 1995 (CANB); Goat House Cave at base of Mt Lidgbird escarpment, 31°33′50″S, 159°05′15″E, 420 m, on trunk of forest tree in moist rainforest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42242*, 7 February 1995 (CANB).

Rimelia austrocetrata occurs in Australia, the North Island of New Zealand, and is uncommon on Norfolk Island (Elix & Streimann, 1989). It is widespread on rock and bark of trees in coastal and hinterland areas of southern and eastern Australia (Elix, 1994). On Lord Howe Island this species occurs on basalt rocks, and on the trunks of forest trees in moist rainforest.

Rimelia austrocetrata is characterized by the conspicuous reticulately-cracked upper cortex which becomes areolate, with the areolae flaking off, the presence of closed or apically-split laminal dactyls, and medullary salazinic acid.

Rimelia cetrata (Ach.) Hale & A.Fletcher, *Bryologist* 93: 26 (1990)

Parmelia cetrata Ach., *Syn. Meth. Lich.*: 198 (1814); *Parmotrema cetratum* (Ach.) Hale, *Phytologia* 28: 335 (1974). *Type*: United States of America, Pennsylvania, *G.H.E.Muhlenberg s.n.*; lecto: H-ACH; isolecto: UPS, *n.v.*, *fide* M.E.Hale & A.Fletcher, *Bryologist* 93: 23 (1990).

Thallus adnate to loosely adnate, coriaceous, 4-10 cm wide. Lobes imbricate or not, subirregular to rounded, laciniate or dissected, 5(-10) mm wide; margins entire or crenulate and weakly sinuate, ciliate; cilia black, slender, simple, moderately dense. Upper surface pale grey, white-maculate, maculae fissuring into reticulate cracks and becoming ±areolate, areolae not flaking off, without soredia or dactyls. Medulla white. Lower surface black, shiny, rhizinate with a thin erhizinate zone at margins of lobes; rhizines black, slender, simple or sometimes squarrosely branched, moderately dense. Apothecia not seen. Pycnidia common at the lobe margins. Conidia filiform, 10-11(-14) x 1 µm.

Chemistry: cortex K+ yellow; medulla K+ yellow then red, C-, KC+ red, P+ orange; containing atranorin, chloroatranorin, salazinic acid (major) and consalazinic acid (minor).

Specimen examined: Lord Howe Island: Kims Lookout, 31°30′59″S, 159°03′12″E, 180 m, on basalt rocks in sparse, heathy vegetation at the edge of stunted lowland forest, *J.A.Elix 42505*, 11 February 1995 (CANB).

Rimelia cetrata is a temperate and subtropical species known from Australia (Tasmania), New Zealand, North and South America, Hawaii and southern Africa (Elix, 1994). On Lord Howe Island, *R. cetrata* was collected on rocks along the edge of stunted, lowland forest.

The species is characterized by the reticulately cracked but relatively smooth upper surface where the areolae do not flake off, the lack of soredia and dactyls and the medullary salazinic acid.

Rimelia reticulata (Taylor) Hale & A.Fletcher, *Bryologist* 93: 28 (1990)

Parmelia reticulata Taylor in J.T.Mackay, *Fl. Hibern.* 2: 148 (1836); *Parmotrema reticulatum* (Taylor) M.Choisy, *Bull. Mens. Soc. Linn. Soc. Bot. Lyon* 21: 175 (1952). *Type*: Ireland, County Kerry, near Dunkerron, *T.Taylor s.n.*; lecto; FH; isolecto: BM, *fide* M.E.Hale & A.Fletcher, *Bryologist* 93: 23 (1990).

Thallus loosely adnate, coriaceous, 5-15(-20) cm wide. Lobes imbricate or often subascending at margins, irregular to sublinear, 5-10(-15) mm wide; margins deeply crenate to lacerate-incised, sometimes becoming laciniate, ciliate; cilia simple, black, slender, moderately dense, 0.2-0.4(-1.0) mm long. Upper surface pale grey-green, maculate, becoming conspicuously reticulate-cracked, smooth to occasionally rugulose, sorediate; soralia marginal, linear to subcapitate; soredia granular, occasionally spreading laminally. Medulla white. Lower surface black, smooth to rugulose, rhizines or papillae extending to margins, or with a thin (1-2 mm), brown, naked zone at lobe margins; rhizines black, simple to sparsely squarrosely branched, forming dense clumps. Apothecia rare, submarginal to laminal, subpedicellate, 2-8 mm wide; disc imperforate (or eventually narrowly perforate), concave, brown; thalline exciple ±crenulate to lacerate; ascospores ellipsoidal, (10-)13-18 x (6-)8-11 µm. Pycnidia usually restricted to fertile thalli, laminal on lobe apices. Conidia filiform, (7-)12-16 x 1-1.7 µm.

Chemistry: cortex K+ yellow; medulla K+ yellow then red, C-, P+ orange-red; containing atranorin, chloroatranorin, salazinic acid (major), consalazinic acid (minor), unknown (trace).

Representative specimens examined (total 17): Lord Howe Island: track to Little Island near Salmon Beach, 31°33′30″S, 159°04′30″E, 5 m, on palm in scrubby, partly disturbed lowland forest, *J.A.Elix 32672*, 20 June 1992 (CANB); along track to Mutton Bird Point, 31°32′45″S, 159°05′00″E, 60 m, on basalt rocks in dry lowland forest, *J.A.Elix 32800*, 21 June 1992 (CANB); along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rock in dense, shrubby vegetation, *J.A.Elix 32924*, 23 June 1992 (CANB).

Rimelia reticulata is a cosmopolitan species; it occurs on bark and rock in all Australian states except the Northern Territory (Elix, 1994) and is very common on Norfolk Island (Elix & Streimann, 1989). On Lord Howe Island, this species is common on basalt rocks and trees in lowland forest and heathy areas.

Rimelia reticulata is a variable species, characterized by the presence of linear to subcapitate, marginal soralia and medullary salazinic acid.

Rimelia stictica Louwhoff & Elix, sp. nov. Figure 2

Species cum thallo ut in *Rimelia cetrata* sed ab hac species lobis angustioribus, tortis et acido stictico, acido menegazziaico, acido cryptostictico, acido constictico et acido methyl stictico continente differt.

Type: Australia, New South Wales, Lord Howe Island, Goat House Cave at base of Mt Lidgbird escarpment, 31°33′50″S, 159°05′15″E, 420 m, on soil and debris in moist rainforest with *Dracophyllum* and *Cyathea*, *J.A.Elix 42275*, 7 February 1995 (CANB).

Thallus loosely adnate, membranaceous to coriaceous, to 3 cm wide. Lobes irregular, twisted, ±revolute, 4-5 mm wide, margins crenate to incised, ±laciniate, ciliate; cilia black, 1-3 mm long, simple, sparse. Upper surface pale grey-green, smooth, with white effigurate maculae; maculae laminal, ±fissuring into reticulate cracks, lacking dactyls, isidia and soredia. Medulla white. Lower surface black, shiny, rhizinate, with naked, brown, marginal zone, 1-3 mm wide; rhizines moderately dense, black, mostly simple, 1-3(-5) mm long. Apothecia and pycnidia not seen.

Chemistry: cortex K+ yellow; medulla K+ yellow then orange, C-, P+ orange; containing atranorin, chloroatranorin, stictic acid (major), menegazziaic acid, cryptostictic acid, constictic acid, peristictic acid, methyl β-orsellinate, methyl stictic acid.

Rimelia stictica is known only from the type collection which was collected from soil and debris in moist rainforest.

This species is characterized by the distorted, revolute lobes which lack soredia, isidia and dactyls, and the presence of a stictic acid chemosyndrome in the medulla. These features distinguish this species from all other species of *Rimelia*. Although morphologically similar to *R. cetrata*, *R. stictica* is distinguished by twisted, ±revolute lobes in contrast to the ±flat, rounded lobes of *R. cetrata*. *Rimelia cetrata* is further distinguished by the presence of medullary salazinic and consalazinic acids.

Xanthoparmelia amplexula (Stirt.) Elix & J.Johnst., in J.A.Elix, J.Johnston & P.M.Armstrong, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 15: 192 (1986)

Parmelia amplexula Stirt., *Trans. & Proc. Roy. Soc. Victoria* 17: 69 (1881). *Type*: Australia, Queensland, near Brisbane, *F.M.Bailey 262*; holo: BM.

Thallus adnate to moderately adnate, 5-10 cm wide. Lobes imbricate or not, often centrally contorted, irregular to sublinear, 0.8-2.0(-3.0) mm wide, with or without flat laciniae on central lobes, with rounded to dentate-incised lobe margins. Upper surface yellow-green, dull or occasionally ±shiny towards apices, dark-tipped isidia causing centre to appear blackened, smooth or ±weakly rugulose, isidiate; isidia simple and globose at first, becoming slender and branched to coralloid, moderately dense to dense particularly on central lobes, apices syncorticate, darkening. Medulla white. Lower surface pale to dark brown; with concolorous, moderately dense, simple, slender rhizines. Apothecia not seen. Pycnidia uncommon, laminal, scattered. Conidia bifusiform, 6-7 x 0.5 mm.

Chemistry: cortex, K-, UV-; medulla K-, C-, KC+ rose, P-; containing usnic acid, loxodin, norlobaridone (major), unknowns (trace).

Representative specimens examined (total 4): Lord Howe Island: ridge to Malabar Hill, 31°31′12″S, 159°03′39″E, 90 m, on top of exposed boulder in dense shrubby vegetation on rocky (basalt) ridge, *H.Streimann 49998*, 22 June 1992 (CANB); Intermediate Hill via track to North Hummock, 31°32′45″S, 159°04′55″E, 120 m, on basalt rocks in lowland forest with dense shrub cover on steep slope, *J.A.Elix 42045*, 5 February 1995 (CANB); Kims Lookout, 31°30′59″S, 159°03′12″E, 180 m, on basalt rocks, in sparse heathy vegetation at the edge of stunted lowland forest, *J.A.Elix 42522*, 11 February 1995 (CANB).

Xanthoparmelia amplexula occurs in South Africa, New Zealand, throughout Australia (Elix, 1994) and also on Norfolk Island (Elix & Streimann, 1989). It is a common and widely distributed species, generally found on rock and rarely on dead wood or soil (Elix, 1994). On Lord Howe Island, *X. amplexula* was collected from rock in stunted lowland forest or in dense, shrubby vegetation.

The species is characterized by the brown lower surface and syncorticate, often black-tipped, isidia and the presence of loxodin and norlobaridone in the medulla. It is similar to *X. scabrosa*, but that species has epicorticate isidia that ultimately become erumpent.

Xanthoparmelia antleriformis (Elix) Elix & J.Johnst., in J.A.Elix, J.Johnston & P.M.Armstrong, *Bull. Brit. Mus. (Nat. Hist), Bot.* 15: 194 (1986)

Parmelia antleriformis Elix, *Austral. J. Bot.* 29: 349 (1981). *Type*: Australia, Western Australia, Eyre District, 2 km south-west of Pallinup River Crossing on Highway 1 towards Albany, 14 January 1979, *B.Barnsley 602*; holo: CANB; iso: MEL.

Thallus adnate to tightly adnate, small foliose, 3-5(-7) cm wide. Lobes imbricate or not, sublinear to sublinear-elongate, irregularly branched, 0.3-1.0 mm wide, margins entire. Upper surface yellow-green, ±faintly maculate, becoming centrally cracked and areolate, isidiate; isidia cylindrical, extensively branched, coralloid or antler-like, 0.5-3.0 mm high, dense, occasionally to the extent of obscuring upper surface, syncorticate, black-tipped. Medulla white. Lower surface pale brown centrally, becoming dark brown towards apices, rhizinate; rhizines concolorous, sparse to moderately dense, simple. Apothecia and pycnidia not seen.

Chemistry: cortex K-; medulla K+ yellow then deep red, C-, P+ deep yellow to orange; containing usnic acid, salazinic acid (major), consalazinic acid, ±norstictic acid (trace).

Representative specimens examined (total 3): Lord Howe Island: along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense shrubby vegetation, *J.A.Elix 33000*, 23 June 1992 (CANB); Intermediate Hill via track to North Hummock, 31°32′45″S, 159°04′55″E, 120 m, on basalt rocks in poor lowland forest with dense shrub cover on steep slope, *J.A.Elix 42044*, 5 February 1995 (CANB).

Xanthoparmelia antleriformis is common in Australia and is also known from South America (Elix, 1994; Nash *et al.*, 1995). On Lord Howe Island, *X. antleriformis* was collected on basalt rocks in dense, heathy vegetation.

This species is characterized by the dense, extensively-branched, antler-like isidia, the narrow lobes, the pale lower surface and the presence of salazinic acid in the medulla.

Xanthoparmelia consociata (Elix) Elix & J.Johnst., in J.A.Elix, J.Johnston & P.M.Armstrong, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 15: 214 (1986)

Parmelia consociata Elix, *Austral. J. Bot.* 29: 352 (1981). *Type*: Australia, Australian Capital Territory, south-west of Glendale Crossing, 13 April 1977, *J.A.Elix 3142*; holo: MEL; iso: CANB.

Thallus adnate to tightly adnate, small foliose to subcrustose, 2-6 cm wide. Lobes contiguous to weakly imbricate, sublinear, subirregularly branched, 0.3-1 mm wide, with entire to occasionally crenulate margins. Upper surface straw-yellow to yellow-green, ±dull centrally becoming shiny towards lobe apices, emaculate, becoming cracked and ±areolate centrally, isidiate; isidia dense, short (up to 0.2 mm high), simple, globose initially, becoming cylindrical, syncorticate, black-tipped. Medulla white. Lower surface pale to dark brown, shiny, rhizinate; rhizines concolorous, simple, sparse to moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex, K-; medulla K+ yellow then deep red, C-, P+ deep yellow/orange; containing usnic acid, salazinic acid (major), ±consalazinic acid (trace), norstictic acid (minor).

Specimens examined (total 2): Lord Howe Island: ridge to Malabar Hill, 31°31′12″S, 159°03′39″E, 90 m, on top of exposed boulder in dense shrubby vegetation on rocky (basalt) ridge, *J.A.Elix 49995*, 22 June 1992 (CANB); along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rocks in dense shrubby vegetation, *J.A.Elix 32992*, 23 June 1992 (CANB).

Xanthoparmelia consociata is a rare, Australian endemic which grows on rock in arid central Australia and subalpine eucalypt forests of southern New South Wales and the Australian Capital Territory (Elix, 1994). On Lord

Howe Island, this species was collected only twice, on basalt rocks in dense, heathy vegetation.

This species is characterized by the adnate to tightly adnate, subcrustose thallus, the simple isidia, the pale lower surface and the medullary chemistry.

Xanthoparmelia exuviata (Kurok.) Hale, *Mycotaxon* 20: 79 (1984)

Parmelia exuviata Kurok., *Bull. Natl. Sci. Mus. Tokyo*, ser. B, 8: 36 (1982). *Type*: Australia, New South Wales, east of Cooma on the Numeralla Road, 2 December 1965, *S.Kurokawa 6449*; holo: TNS; iso: CANB.

Thallus foliose, loosely adnate, 2-4(-9) cm wide. Lobes imbricate or not, older lobes occasionally becoming entangled, younger lobes subascending, sublinear, irregularly branched 1-1.5(-3) mm wide, with entire to occasionally crenulate margins, ±incised at apices. Upper surface yellow-green, emaculate; older lobes becoming cracked and ±areolate, upper cortex fragile and occasionally ±flaking off in places, isidiate; isidia dense, cylindrical, simple or sparsely branched, epicorticate, rarely erumpent, esorediate. Medulla white. Lower surface brown, rhizinate; rhizines concolorous, simple, sparse to moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K-, UV-; medulla K-, C-, KC-, P-; containing usnic acid, exuviatic acids A1, A2 and B.

Representative specimens examined (total 6): Lord Howe Island: summit of Malabar Hill, 31°30′52″S, 159°03′36″E, 205 m, on basalt rocks in open, exposed heathy area above cliffs, *J.A.Elix 32947*, 23 June 1992 (CANB); Kims Lookout, 31°30′59″S, 159°03′12″E, 180 m, on exposed boulder in sparse heathy vegetation at the edge of stunted lowland forest, *H.Streimann 55740A*, 6 February 1995 (CANB); Mt Eliza, 21°30′52″S, 159°02′20″E, 130 m, on exposed boulder amongst exposed rock faces in steeply sloping SE grasslands, *H.Streimann 55792*, 6 February 1995 (CANB).

Xanthoparmelia exuviata is an endemic species of eastern and central Australia; occurring in upland regions, in arid or subarid areas or areas of moderate rainfall (Elix, 1994). On Lord Howe Island this species has been collected on basalt rocks in exposed situations.

This species is characterized by the isidiate upper surface, the pale lower surface and the presence of the exuviatic acids in the medulla. The unique chemistry readily separates this species from the morphologically similar, *X. scabrosa* (Taylor) Hale, which contains loxodin and norlobaridone.

Xanthoparmelia flavescentireagens (Gyeln.) D.J.Galloway, *New Zealand J. Bot.* 18: 533 (1980)

Parmelia flavescentireagens Gyeln., *Repert. Spec. Nov. Regni. Veg.* 36: 154 (1934). *Type*: Australia, Australian Capital Territory, Booroomba Rocks, February 1906, *G.H.Barker s.n.*; holo: BP.

Thallus loosely adnate to adnate, to 3-6 cm wide. Lobes imbricate or not, flat to subascending centrally and ±weakly convolute, irregular to sublinear, subirregularly branched, 1-3 mm wide, with entire to crenulate margins, rotund or ±incised at apices, laciniate; laciniae primarily on central lobes, imbricate, subascending and occasionally forming a thick mat on the upper surface, dichotomously to irregularly-sublinearly branched, 0.5-1.0 mm wide. Upper surface yellow green, dull or ±shiny towards apices, emaculate, smooth. Medulla white. Lower surface pale brown, darker brown towards apices, ±weakly convolute or not, rhizinate; rhizines concolorous, sparse to moderately dense, slender, simple. Apothecia immature, to 1.0 mm wide; disc deeply concave, pale brown; thalline exciple smooth. Pycnidia common. Conidia filiform or ±weakly bifusiform, 5-7 x 0.5-0.8 µm.

Chemistry: cortex K-, UV-; medulla K-, C-, KC+ rose, P-; containing usnic acid, loxodin, norlobaridone (major).

Specimen examined: Lord Howe Island: Kims Lookout, 31°30′59″S, 159°03′12″E, 180 m, on basalt rocks in sparse heathy vegetation at the edge of stunted lowland forest, *J.A.Elix 42516*, 11 February 1995 (CANB).

Xanthoparmelia flavescentireagens is very common in Australia and New Zealand (Elix, 1994), and also occurs in South America (Nash *et al.*, 1995). On Lord Howe Island, the sole specimen of *X. flavescentireagens* was collected on basalt rock in stunted lowland forest.

This species is characterized by the presence of norlobaridone and loxodin in the medulla, loosely to moderately adnate lobes which are appressed to the substratum at the apices, the lack of isidia and the pale lower surface.

Xanthoparmelia isidiigera (Müll.Arg.) Elix & J.Johnst., in J.A.Elix, J.Johnston & P.M.Armstrong, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 15: 272 (1986)

Parmelia conspersa var. *laxa* f. *isidiigera* Müll.Arg., *Flora* 66: 48 (1883); *Parmelia isidiigera* (Müll.Arg.) Gyeln., *Ann. Hist.-Nat. Mus. Natl Hung.* 29: 27 (1953), *nom. illegit. non Parmelia isidiigera* (Müll.Arg.) Vain., *Mém. Herb. Boissier* 5: 6 (1900). *Type*: Australia, Western Australia, King George Sound, *Harris 52*; lecto: G; isolecto: US *fide* M.E.Hale, *Smithsonian Contr. Bot.* 74: 132 (1990).

Thallus foliose, moderately to loosely adnate, 4-10 cm wide. Lobes imbricate or not, flat or rarely convex, sublinear to irregular, irregularly branched, 1-2 mm wide, occasionally with narrower (0.5-1.0 mm wide) laciniae overlapping central lobes; margins entire to ±crenulate. Upper surface yellow-green, smooth or central lobes cracked, emaculate, shiny at least near lobe apices, isidiate; isidia globose initially, becoming cylindrical, slender or sparingly branched, syncorticate and usually black-tipped, scattered or forming dense, central clusters. Medulla white. Lower surface black, shiny, sometimes with a dark brown margin at lobe apices, smooth, rhizinate; rhizines black, short and simple, sparse to moderately dense. Apothecia and pycnidia not seen.

Chemistry: cortex K-; medulla K+ yellow then deep red, C-, KC+ yellow then deep red, P-; containing usnic acid, salazinic acid (major), ±consalazinic acid (trace).

Representative specimens examined (total 3): Lord Howe Island: between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks amongst large boulders with scattered large *Ficus*, small shrubs and ferns, *J.A.Elix 42317*, 7 February 1995 (CANB); Kim's lookout, 31°30′59″S, 159°03′12″E, 180 m, on basalt rocks in sparse heathy vegetation at the edge of stunted lowland forest, *J.A.Elix 42512*, 11 February 1995 (CANB).

Xanthoparmelia isidiigera is a common and widespread species in Australia (Elix, 1994). It also occurs in Papua New Guinea, New Zealand (Elix, 1994), South Africa (Hale, 1990) and South America (Nash *et al.*, 1995). On Lord Howe Island this species has been collected from basalt rocks in stunted lowland forest and in heathy vegetation.

This lichen is characterized by the black lower surface, isidia which are globose at first and then become slender, cylindrical and sparingly branched, and the presence of salazinic acid in the medulla. Neither apothecia nor pycnidia were observed on specimens collected from Lord Howe Island, although pycnidia are reported to be common (Elix, 1994).

Xanthoparmelia tasmanica (Hook.f. & Taylor) Hale, *Phytologia* 28: 489 (1974)

Parmelia tasmanica Hook.f. & Taylor, *London J. Bot.* 3: 644 (1844). *Type*: Australia, Tasmania, *R.C.Gunn*; lecto: FH; isolecto: BM, *fide* M.E.Hale, *Smithsonian Contr. Bot.* 74: 209 (1990).

Parmelia stramineonitens Zahlbr., *Ann. K. K. Naturhist. Hofmus.* 11: 195 (1896). *Type*: Australia, Lord Howe Island, *Moore 17*; lecto: W; isolecto: G, *fide* M.E.Hale, *Smithsonian Contr. Bot.* 74: 209 (1990).

Thallus foliose, loosely adnate, 5-15 cm wide. Lobes variable, imbricate, flat, subirregular to sublinear, irregularly branched, 1.5-5 mm wide, laciniate, with entire to occasionally ±crenate margins; laciniae subdichotomously to irregularly branching, most abundant on central lobes and often forming a thick mat on the upper surface, 1-2 mm wide. Upper surface yellow-green, smooth or older lobes faintly cracked, emaculate, shiny at lobe apices, lacking isidia or soredia. Medulla white. Lower surface black, brown towards apices, shiny, smooth, rhizinate; rhizines black, short and thick, simple, sparse. Apothecia subpedicellate, to 1-5 mm wide; disc deeply concave to almost flat, dark brown; thalline exciple smooth, shiny, involute at first, entire or crenulate; ascospores 10-11 x 6-7 μm. Pycnidia scattered, laminal. Conidia bifusiform 5-6(-7) x 1 μm.

Chemistry: cortex K-, UV-; medulla K+ yellow then deep red, C-, C+ yellow then red, P+ orange; containing atranorin, usnic acid, salazinic acid, consalazinic acid, norstictic acid (trace).

Representative specimens examined (total 7): Lord Howe Island: ridge to Malabar Hill, 31°31′12″S, 159°03′39″E, 90 m, on shaded boulder in dense shrubby vegetation on rocky (basalt) ridge, *H.Streimann 49979*, 22 June 1992 (CANB); along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rock in dense shrubby vegetation, *J.A.Elix 32922*, 23 June 1992 (CANB); along ridge to Malabar Hill, 31°31′16″S, 159°03′50″E, 80 m, on basalt rock in dense shrubby vegetation, *J.A.Elix 32894*, 23 June 1992 (CANB).

Xanthoparmelia tasmanica is particularly common in Australia and is also known from New Zealand, North, Central and South America, East and South Africa (Elix, 1994; Nash *et al.*, 1995). On Lord Howe Island this species was collected on rocks in dense, shrubby vegetation.

Xanthoparmelia tasmanica is characterized by the loosely adnate thallus with dense, imbricate laciniae, the lack of isidia, the black lower surface and the presence of salazinic acid in the medulla.

Xanthoparmelia thamnoides (Kurok.) Hale, *Phytologia* 28: 489 (1974)

Parmelia thamnoides Kurok., *J. Hattori Bot. Lab.* 32: 213 (1969). *Type*: Australia, Queensland, Freshwater Gorge, NW of Cairns, 6 November 1965, *S.Kurokawa 5723*; holo: TNS; iso: MEL.

Thallus foliose, adnate to moderately adnate, 5-10 cm wide. Lobes imbricate or not, subirregular to sublinear-elongate, irregularly branched, 1-2(-4) mm wide, with entire to ±crenate or occasionally incised margins. Upper surface yellow-green, occasionally somewhat blackened centrally, smooth or rugose centrally, shiny, emaculate, isidiate; isidia sparse to moderately dense, slender, cylindrical and becoming coralloid-branched, syncorticate. Medulla white. Lower surface black, dark brown towards apices, shiny, smooth and somewhat thickened at margins, rhizinate; rhizines black, sparse to moderately dense, slender, simple. Apothecia and pycnidia not seen.

Chemistry: cortex K-, UV-; medulla K-, C-, KC+ rose, P-; containing usnic acid, loxodin, norlobaridone (major), ±protoconstipatic acid, ±subnorlobaridone.

Representative specimens examined (total 18): Lord Howe Island: ridge east of Malabar Hill, 31°30′51″S, 159°03′40″E, 180 m, on semi-exposed boulders (basalt) in open exposed heathy area on ridge above cliffs, *H.Streimann 50092*, 23 June 1992 (CANB); between Little Island and The Cross, 31°34′18″S, 159°04′30″E, 120 m, on basalt rocks, amongst exposed boulders with scattered large *Ficus*, small shrubs and ferns, *J.A.Elix 42295*, 7 February 1995 (CANB); track to Kims Lookout, 31°30′59″S, 159°03′12E, 180 m, on basalt rocks in stunted lowland forest, *J.A.Elix 42347*, 9 February 1995 (CANB); Rocky Run Creek, 31°33′20″S, 159°05′33″E, 35 m, on basalt rocks in lowland forest beside rocky stream, *J.A.Elix 42495*, 10 February 1995 (CANB).

Xanthoparmelia thamnoides occurs on rocks in eastern and southern Australia and in New Zealand, including several offshore islands (Elix, 1994; Hayward *et al.*, 1991). On Lord Howe Island *X. thamnoides* is common on basalt rocks in lowland forest or in exposed situations.

This species is characterized by the adnate thallus, the cylindrical coralloid-branched isidia, the black lower surface and the medullary chemistry.

DISCUSSION

In Australia the Parmeliaceae are represented by 395 species in 31 genera, with *Xanthoparmelia, Hypotrachyna* and *Parmotrema* containing most species. *Xanthoparmelia* is primarily a Southern Hemisphere genus with its main areas of speciation in Australia and South Africa, whereas *Hypotrachyna* and *Parmotrema* are widely distributed throughout the tropics and temperate regions (Elix, 1994). On Lord Howe Island, *Xanthoparmelia* is the best represented parmelioid genus (8 species), followed by *Parmotrema* (6 species). No species of *Hypotrachyna* were recorded and this genus is also absent from Norfolk Island. Of the parmelioid genera found on Lord Howe Island, *Myelochroa, Parmelia, Parmotrema* and *Rimelia* are considered to have a cosmopolitan distribution, although the latter is believed to have its main area of speciation in South America (Elix, 1994). All of the other parmelioid genera on the island have a predominantly Southern Hemisphere distribution, with main areas of speciation in South America/South Africa (*Bulbothrix*), South Africa/Australia (*Xanthoparmelia*), South America/Australia (*Flavoparmelia)*, Australia (*Paraparmelia*) or South-East Asia (*Relicina*) (Elix, 1994).

Lord Howe Island has an unusual mixture of vascular plant communities with a high proportion of endemic species, and some which are endemic to it and Norfolk Island (Green, 1994). Floristically, both islands are more closely related to New Zealand and New Caledonia than to mainland Australia. Twelve of the 17 parmelioid species (71%) occurring on Norfolk Island also occur in New Zealand. By comparison, 11 of 31 taxa (35.5%) observed on Lord Howe Island occur in New Zealand. Further studies are required to establish if such a relationship also exists between the lichen floras of Lord Howe Island and New Caledonia. With the exception of four species (*Bulbothrix lordhowensis, Flavoparmelia norfolkensis, Paraparmelia huttonii, Rimelia stictica* and *Parmotrema defectum*), all other species reported from Lord Howe Island and Norfolk Island also occur in mainland Australia.

The Norfolk Island complex is the closest group of islands to Lord Howe Island and although of similar size, it is of lower altitude. The summit complex of Norfolk Island is just below 320 metres but, even though Lord Howe Island is higher, Parmeliaceae were rarely collected at altitudes above

TABLE 1

Parmeliaceae on Lord Howe Island and Norfolk Island.

Species	**Lord Howe Is.**	**Norfolk Is.**
Bulbothrix goebelii (Zenker) Hale	+	
B. lordhowensis Elix	+	
B. queenslandica (Elix & G.N.Stevens) Elix	+	
B. tabacina (Mont. & v.d.Bosch) Hale	+	+
Flavoparmelia euplecta (Stirt.) Hale	+	
F. haysomii (C.W.Dodge) Hale	+	
F. norfolkensis Elix & Streimann		+
Myelochroa aurulenta (Tuck.) Elix & Hale	+	
Neofuscelia pulla (Ach.) Essl.	+	
N. verrucella (Essl.) Essl.		+
Paraparmelia huttonii Louwhoff & Elix	+	
P. murina (Kurok.) Elix & J.Johnst.	+	
P. scotophylla (Kurok.) Elix & J.Johnst.		+
Parmelia erumpens Kurok.	+	+
P. queenslandensis Hale	+	
Parmelinopsis spumosa (Asah.) Elix & Hale		+
Parmotrema austrosinense (Zahlbr.) Hale	+	
P. chinense (Osbeck) Hale & Ahti		+
P. crinitum (Ach.) M.Choisy	+	+
P. cristiferum (Taylor) Hale	+	+
P. defectum (Hale) Hale	+	
P. gardneri (C.W.Dodge) Sérus.	+	+
P. rampoddense (Nyl.) Hale		+
P. sancti-angelii (Lynge) Hale		+
P. tinctorum (Despr. ex Nyl.) Hale	+	+
Relicina filsonii Elix & J.Johnst.	+	
Rimelia austrocetrata (Elix & J.Johnst.) Hale & A.Fletcher	+	+
R. cetrata (Ach.) Hale & A.Fletcher	+	
R. reticulata (Taylor) Hale & A.Fletcher	+	+
R. stictica Louwhoff & Elix	+	
Xanthoparmelia amplexula (Stirt.) Elix & J.Johnst.	+	+
X. antleriformis (Elix) Elix & J.Johnst.	+	
X. australasica D.J.Galloway		+
X. consociata (Elix) Elix & J.Johnst.	+	
X. exuviata (Kurok.) Hale	+	
X. flavescentireagens (Gyeln.) D.J.Galloway	+	
X. isidiigera (Müll.Arg.) Elix & J.Johnst.	+	
X. tasmanica (Hook.f. & Taylor) Hale	+	
X. thamnoides (Kurok.) Hale	+	

320 metres. The vegetation and climate of the islands are similar but in the Parmeliaceae, species diversity is greater on Lord Howe Island (Table 1). A total of 17 species from 7 genera are reported from Norfolk Island, as opposed to the 31 species in 10 genera from Lord Howe Island. The two island complexes have only 9 taxa in common and these comprise primarily 'weedy' species in the genera *Parmotrema* and *Rimelia* (Table 1).

Species with vegetative propagules are often successful colonizers (Galloway, 1979) as the isidia/soredia and/or thallus fragments are easily transported by wind. Vegetative propagules may also be dispersed by migratory birds (Galloway, 1979, Jørgensen, 1983) which nest in places such as Lord Howe Island. Although these methods of dispersal also apply to spores, this only ensures transportation of one component of the lichen thallus, so propagules or thallus fragments (with both fungal and algal components) are a more efficient means of dispersal. Thus, the isidiate or sorediate counterparts of fertile species are usually much more widespread (Jørgensen, 1983). It is perhaps not surprising that the 'weedy' Parmeliaceae which occur commonly along coasts (Hayward *et al.*, 1991) and have been collected on Lord Howe Island, Norfolk Island and on many of the off-shore islands of northern New Zealand, reproduce by thallus fragmentation and/or distribution of vegetative propagules. These species include: *Neofuscelia pulla, Parmelia erumpens, Parmotrema crinitum, P. cristiferum, Rimelia cetrata, R. reticulata, Xanthoparmelia isidiigera* and *X. flavescentireagens*. Possibly these species are successful colonizers because of their ability to survive in exposed situations, often under severe climatic conditions (Hayward *et al.*, 1991). Such situations (e.g. on exposed coastal cliffs) are prime targets for wind-dispersed spores or propagules, as well as providing niches where seabirds are likely to nest, further aiding dispersal. Vegetative propagules also aid in the dispersal and spread of a species once an area has been colonized (Stenroos & Smith, 1993).

Only two taxa (*Rimelia reticulata* and *Xanthoparmelia tasmanica*) collected on Lord Howe Island possessed mature apothecia, while two others (*Relicina filsonii, Xanthoparmelia flavescentireagens*) were observed with immature apothecia. Specimens of all other species were found to be isidiate, sorediate, or else possibly reproducing by means of thallus fragmentation. Similarly, on the Hawaiian Islands, only five of the 37 parmelioid species produced apothecia (Smith 1993), suggesting that it is not unusual for island lichens to rely upon methods of vegetative reproduction.

ACKNOWLEDGEMENTS

We thank the Australian Research Council for generous financial support of this project, and Drs A. W. Archer, D. J. Galloway and P. M. McCarthy for their helpful comments on the manuscript. We also wish to thank Mr Stuart Hay and Neal McCracken of the Photographic Unit, ANU for preparing the photographs, Mr D. Verdon for checking the Latin descriptions and the following colleagues and herbaria for making collections available: Ms Jen Johnston (CANB), Dr J. Ross (MEL) and Mr H. Streimann (CANB).

LITERATURE CITED

Archer, A. W. & Elix, J. A. (1994). The lichens of Lord Howe Island. 1: Introduction and the genus *Pertusaria* (Pertusariaceae). *Telopea* **6**: 9-30.

Culberson, C. F. (1972). Improved conditions and new data for the identification of lichen products by a standardized thin-layer chromatographic method. *Journal of Chromatography* **72**: 113-125.

Culberson, C. F., Culberson, W. L. & Johnson, A. (1981). A standardized TLC analysis of β-orcinol depsidones. *Bryologist* **84**: 16-29.

Culberson, C. F. & Johnson, A. (1982). Substitution of methyl *tert*.-butyl ether for diethyl ether in the standardized thin-layer chromatographic method for lichen products. *Journal of Chromatography* **238**: 483-487.

Elix, J. A. (1993). Progress in the generic delimitation of *Parmelia* sensu lato (Ascomycotina: Parmeliaceae) and a synoptic key to the Parmeliaceae. *Bryologist* **96**: 359-383.

Elix, J. A. (1994). *Bulbothrix, Flavoparmelia, Myelochroa, Neofuscelia, Paraparmelia, Parmelia, Parmotrema, Relicina, Rimelia* and *Xanthoparmelia*. *Flora of Australia* **55**: 13-312.

Elix, J. A., & Ernst-Russell, K. D. (1993). *A Catalogue of Standardized Thin Layer Chromatographic Data and Biosynthetic Relationships for Lichen Substances*, 2nd edn. Canberra: Australian National University.

Elix, J. A., Johnston, J. & Parker, J. L. (1988). A computer program for the rapid identification of lichen substances. *Mycotaxon* **31**: 89-99.

Elix, J. A. & Streimann, H. (1989). The lichens of Norfolk Island. 1: Introduction to the family Parmeliaceae. *Proceedings of the Linnean Society of New South Wales* **111**: 103-121.

Feige, G. B., Lumbsch, H. T., Huneck, S. & Elix, J. A. (1993). The identification of lichen substances by a standardized high-performance liquid chromatographic method. *Journal of Chromatography* **646**: 417-427.

Galloway, D. J. (1979). Biogeographical elements in the New Zealand lichen flora. *In: Plants and Islands* (Bramwell, D., Ed.). London, New York, San Francisco: Academic Press.

Green, P. S. (1994). Norfolk Island and Lord Howe Island. *Flora of Australia* **49**: 1-26.

Hale, M. E. (1965). A monograph of *Parmelia* subgenus *Amphigymnia*. *Contributions from the United States National Herbarium* **36**: 193-358.

Hale, M. E. (1990). A synopsis of the lichen genus *Xanthoparmelia* (Vainio) Hale (Ascomycotina, Parmeliaceae). *Smithsonian Contributions to Botany* **74**: 1-250.

Hayward, B. W., Wright, A. E. & Hayward, G. C. (1991). Lichens of Little Barrier Island (Hauturu), northern New Zealand. *Records of the Auckland Institute and Museum* 28: 185-199.

Hutton, I. (1986). *Discovering Australia's World Heritage, Lord Howe Island.* Conservation Press: Canberra, Australia.

Jørgensen, P. M. (1983). Distribution patterns of lichens in the Pacific region. *Australian Journal of Botany, Supplementary Series* **10**: 43-66.

Nash, T. H. III, Gries, C., & Elix, J. A. (1995). A revision of the lichen genus *Xanthoparmelia* in South America. *Bibliotheca Lichenologica* **56**: 1-158.

Smith, C. W. (1993). Notes on Hawaiian parmelioid lichens. *Bryologist* **96**: 326-332.

Stenroos, S. & Smith, C.W. (1993). Notes on the amphipacific relations of Hawaiian Cladoniaceae. *Tropical Bryology* **8**: 275-280.

MYCOTAXON

Volume LXVIII, pp. 465-482 July-September 1998

THE CHEMISTRY OF SOME SPECIES OF BUELLIA SENSU LATO (LECANORALES, LICHENIZED ASCOMYCOTINA)

KLAUS KALB

Lichenologisches Institut Neumarkt, Im Tal 12, D-92318 Neumarkt, Germany

JOHN A. ELIX

Department of Chemistry, The Faculties, Australian National University, Canberra, ACT 0200, Australia

ABSTRACT : The chemistry of 47 species belonging to the lichen genus *Buellia* sensu lato has been investigated, in most cases for the first time. *Buellia parasema* de Not. has been confirmed as type species for *Buellia* sensu stricto, while lectotype specimens have been selected for *Buellia parasema, B. disciformis, B. termitophila* and *B. xylophila* and their chemistry studied.

Introduction

In the course of a revision of taxa belonging to the lichen forming genus *Buellia* sensu lato, we have examined numerous type collections from different parts of the world. In general, the chemistry of the lichen genus *Buellia* is not well known. Only scattered notes are to be found in the literature (ELIX *et al.* 1990, 1991; HARPER & LETCHER 1966; HARRIS 1988, 1990, 1995; HUNECK & SIEGEL 1963; LEUCKERT & MATHEY 1975; SCHEIDEGGER & RUEF 1988; SIPMAN 1992). As we had access to many type or other authentic collections, we have investigated the chemistry of 47 taxa mainly from the subtropics or tropics, which grow on bark or wood.

Before systematic decisions could be made, a type species and type specimen of the genus *Buellia* had to be identified. We have confirmed *Buellia parasema* de Not. as the type species and selected a specimen from the de Notaris herbarium as lectotype.

Material and methods

The material was sent on loan from the herbaria indicated. Small fragments have been removed under a dissecting microscope to make sure that no contamination by other lichens occurred and to save the valuable material. Natural compounds were characterized by thin-layer chromatography (TLC) according to the methods standardized for lichen products (CULBERSON 1972; ELIX & ERNST-RUSSEL 1993), and by high-performance liquid chromatography (HPLC) with retention index values (R_I) calculated from benzoic acid and solorinic acid controls (FEIGE *et al.* 1993). The HPLC was coupled to a photodiode array detector for ultraviolet spectroscopic comparisons. By this means the ultraviolet spectra observed for the various components eluting in the HPLC chromatogram were recorded and computer-matched against a library of ultraviolet spectra recorded for authentic metabolites under identical conditions (ELIX *et al.* 1997).

Results

1. *Buellia adaucta* Malme

Ark. Bot. 21 A(14): 21 (1927).

BRAZIL/MATO GROSSO: Estrada do Pantanal, several kilometers E of Coxim, in a dense underbrush along a tributary of the Rio Taquarí, 270 m, leg.: K. Kalb 28630, VIII. 1980 (KALB).

Major substance: pigmentosin D; minor substances: atranorin, lichexanthone, norstictic acid, pigmentosin B, E, F, G.

The type material was examined but was not used to determine the chemistry as this species is very distinctive because of its polyspored asci. The material cited above (which was used for the chemical examination) was collected near the type locality and was found to be morphologically identical with the type. The pigmentosin derivatives are quinonoid compounds of undetermined structure first recorded in several *Xanthoparmelia* species (the schenckiana unknowns) (HALE 1990). Pigmentosin D is the major pigment present in *Xanthoparmelia colorata* (Gyeln.) Hale (ELIX 1998).

2. *Buellia aggrediens* (Stirton) Zahlbr.

Cat. Lich. Univ. 7: 333 (1931).

≡ *Lecidea aggrediens* Stirton

Proc. Phil. Soc. Glasgow 11: 313 (1879).

INDIA: Neilgherries; leg.: Watt (holotype - BM).

Major substances: thuringione, arthothelin; minor substance: 4,5-dichloronorlichexanthone.

3. *Buellia bellardii* Sipman

Trop. Bryology 6: 19 (1992).

VENEZUELA/ESTADO BOLIVAR: Cerro Guaiquinima, near NE edge of upper plateau, 1200 m, leg.: H. Sipman 26823, II. 1990 (B).

Major substance: lobaric acid; minor substances: chiodectonic acid, sublobaric acid.

VENEZUELA/ESTADO BOLIVAR: Cerro Guaiquinima, near west end of upper plateau; leg.: H. Sipman 27243, II. 1990 (isotype - B).

Major substance: lobaric acid; minor substances: sublobaric acid, lichexanthone.

4. *Buellia caloosensis* Tuck.

Syn. N. Amer. lich. II: 99 (1888).

USA/FLORIDA: Caloosa River; leg.: Austin, 1878 (holotype - FH).

Major substance: barbatic acid; minor substances: lichexanthone, obtusatic acid.

5. *Buellia catasema* (Tuck.) Tuck.

Syn. N. Amer. lich. II: 161 (1888).

≡ *Lecidea catasema* Tuck.

Proc. Amer. Acad. Arts and Sci. 6: 283 (1864).

CUBA: Guayaral, on palm (dead wood). - Wright, Lich. Cub. 242 (lectotype - FH; selected by APTROOT 1987a)

Major substance: barbatic acid; minor substances: lichexanthone, obtusatic acid.

HAWAII/OAHU: Pupukea, on dead *Acacia koa* in open forest of introduced *Eucalyptus* and *Mimusops*; leg.: O. & I. Degener 30088, VIII. 1965 (M).

Major substance: barbatic acid; minor substances: lichexanthone, obtusatic acid.

6. *Buellia chermesina* Kalb

Lich. Neotrop. Fasc. 9: 5 (1986).

KENYA/COAST PROVINCE: Kwale District, Shimba Hills, on *Pinus* spec., 300 m, leg.: K. Kalb & A. Schrögl, IX. 1985. - Lichenes Neotropici 358 (holotype - KALB).

Major substance: 3-*O*-methylthiophanic acid; minor substances: arthothelin, chiodectonic acid, thiophanic acid.

7. *Buellia crocata* Zahlbr.

Ann. Mycol. 29: 86 (1931).

JAPAN/PROV. KII: Mt. Ko-ya; leg.: Y. Asahina, II. 1926 - Lich. Jap. 555 (holotype - W).

Major substance: barbatic acid; minor substance: obtusatic acid.

8. *Buellia curtisii* (Tuck.) Imshaug in Brodo

Lich. Long Island: 253 (1968).

≡ *Gyrostomum curtisii* Tuck.

Amer. Journ. Sci. and Arts, ser. 2, 25: 430 (1858).

USA/LOUISIANA: West Baton Rouge Parish, on *Carpinus caroliniana*; leg.: S. Tucker 15913, IV. 1976 - Lich. ex. Colo. 541 (KALB).

Major substance: norstictic acid; minor substances: atranorin, dissectic acid, stictic acid, unknown pigments.

9. *Buellia deightonii* Dodge

Ann. Missouri Bot. Garden 40(4): 392 (1953).

SIERRA LEONE: Njala (Kori), in dead trunk of *Amphimas pterocarpoides*; leg.: F. C. Deighton M4334B, X. 1951 (holotype - FH).

Major substance: lobaric acid; minor substances: 4,5-dichlorolichexanthone, unknown.

10. *Buellia diorista* (Nyl.) Zahlbr.

Cat. Lich. Univ. 7: 349 (1931).

≡ *Lecidea diorista* Nyl.

Flora 52: 71 (1869).

INDIA: West Bengal, Baneegung; leg. S. Kurz, 1866 (isotype - M).

Major substance: 4,5-dichlorolichexanthone.

11. *Buellia efflorescens* Müll. Arg.

Hedwigia 32(3): 129 (1893).

FIJI ISLANDS: Viti Levu; Matacawa Road west of Tavua, on bark of tree in field; leg.: O. & I. Degener 31803, XII. 1968 (B).

Major substances: lobaric acid, 4,5-dichlorolichexanthone.

SINGAPORE: Fort Canning Park in the city, on tree in park, 1°17′N, 103°51′E, *ca.* 20 m, leg. A. & M. Aptroot 25954, VI. 1989 („topotype“- B) .

Major substances: lobaric acid, 4,5-dichlorolichexanthone.

12. *Buellia elizae* (Tuck.) Tuck.

Lichens of California, Oregon and the Rocky Mountains: 25 (1866).

≡ *Lecidea elizae* Tuck.

Amer. Journ. Sci. and Arts, ser. 2. 25: 428 (1858).

USA/MASSACHUSETTS: New Bedford; leg.: H. Willey (UPS).

Major substance: barbatic acid; minor substance: obtusatic acid.

Although we have seen the type specimen, it was too small for chemical analysis. Consequently we have analysed fragments from plentiful material collected by Willey and distributed to several herbaria. As the species is very distinctive because of the scarlet red pruina of the apothecia and the fine granular thallus, we are confident of this identification. Furthermore, we have analysed the type of *Buellia crocata* which clearly is a later synonym, and have found the same chemistry (see above).

13. *Buellia epimarta* (Nyl.) Malme

Ark. Bot. 21 A(14): 20 (1927).

≡ *Lecidea epimarta* Nyl.

Ann. Sci. Nat. Bot. 4 (15): 48 (1861).

NEW CALEDONIA: Grand Terre; Province Nord: East coast, *ca.* 10 km W of Touho, in a mangrove swamp with *Rhizophora* spec. 2 m, 21° 15′ S, 165° 37′ E; leg.: K. & A. Kalb 27431, VIII. 1994 (KALB).

Major substance: norstictic acid; minor substances: atranorin, connorstictic acid, parietin.

NYLANDER (1861) described this species from New Caledonia, but as is common with many Nylander types, this specimen is too minute for chemical analysis. Consequently we have studied material collected recently on the same island.

This is the only species of *Buellia* sensu lato that we have observed with parietin as pruina on the discs of the apothecia. Furthermore this is the first report of this, otherwise widespread, anthraquinone in the genus.

14. *Buellia gerontoides* (Stirton) Imshaug

Farlowia 4(4): 490 (1955).

≡ *Lecidea gerontoides* Stirton

Trans. Glasgow Soc. Field Naturalists 4: 165 (1876).

Syn.: *Catillaria gerontoides* (Stirton) Zahlbr.

Cat. Lich. Univ. 4: 17 (1926).

BRAZIL/SANTA CATARINA: Ilha de Santa Catarina, northeastern part, Praia do Santinho, in a 'Restinga'; leg.: K. Kalb 28638, V. 1980 (KALB).

Major substances: 2-chloro-6-*O*-methylnorlichexanthone, norstictic acid; minor substances: connorstictic acid, unknown pigment.

WEST INDIES: St. Croix, leg. Breutel (H).

Major substances: thiophaninic acid, norstictic acid; minor substances: lichexanthone, 2-chloro-6-*O*-methylnorlichexanthone, connorstictic acid, 2,4-dichlorolichexanthone.

While the type specimen contains thiophaninic and norstictic acids (identified by Harris 1971; in sched.), the concentration of xanthones in other collections seems to vary to some extent. In particular, thiophaninic acid which is responsible for the yellow colour of the thallus, may be present or absent. In the latter case the thallus is more or less grey in colour. Similar observations have been made for *Buellia glaziouana* (IMSHAUG 1955a).

15. *Buellia hypopelidna* (Stirton) Müll. Arg.

Bull. Herb. Boissier II, appendix 1: 71 (1894).

≡ *Lecidea hypopelidna* Stirton

Proc. Roy. Phil. Soc. Glasgow 10: 298 (1877).

NEW CALEDONIA: Grande-Terre; Province Nord: Westcoast, Oundjo, *ca.* 18 km W of Kone; in a mangrove, 3 m, 21°03′ S, 164°42′ E; leg.: K. & A. Kalb 27434, VIII. 1994 (KALB).

Major substances: thuringione, arthothelin; minor substances: 4,5-dichloronorlichexanthone, 4,5-dichloro-3-*O*-methylnorlichexanthone.

Unfortunately, the type material could not be traced, but according to the excellent description given by STIRTON (i.e. thallus structure, spore size, and the chemistry of K+ yellow, KC+ reddish, C+ orange), we are confident that our identification is correct.

16. *Buellia japonica* (Tuck.) Tuck.

Lichens of California, Oregon and the Rocky Mountains: 25 (1866).

≡ *Lecidea japonica* Tuck.

Proc. Amer. Acad. Arts and Sci. 5: 421 (1862).

JAPAN: US Navy Pac. Explor. Exped.; leg.: C. Wright (holotype - FH).

Major substance: flavoobscurin B1.

BRAZIL/SÃO PAULO: County Rio Claro, *ca.* 2 km W of Rio Claro, 650 m, leg.: K. Kalb & M. Jorge 28566, V. 1980 (KALB).

Major substances: flavoobscurin B1, unknown pigment; minor substances: flavoobscurin X, myeloconone D1.

The differences in chemistry of the two specimens probably only reflect differences in the amount of material taken for analysis. Naturally we have only used very small fragments of the type material, but more substantial amounts from our own extensive collections. The spore type of this species and the greenish brown, granular to squamulose thallus make it very distinctive within the genus, so that misidentifications are unlikely. Myeloconone D1 and D2 are two closely related yellow pigments of unknown chemical structure. Their chromatographic and spectroscopic properties have been described recently (BÜDEL & ELIX 1997).

17. *Buellia melanochlora* (Krempelh.) Müll. Arg.

Flora 68: 510 (1885).

≡ *Lecidea melanochlora* Krempelh.

Flora 59: 250 (1876).

BRAZIL/RIO DE JANEIRO: leg.: A. Glaziou 6293 (lectotype - M; selected by Imshaug 1955a).

Major substances: arthothelin, thuringione; minor substances: 6-*O*-methylarthothelin, 3-*O*-methylthiophanic acid.

The investigation of an isolectotype (W) has revealed the same chemistry.

18. *Buellia melaxanthella* (Nyl.) Müll. Arg.

Bull. Herb. Boissier 2, appendix 1: 71 (1894).

≡ *Lecidea melaxanthella* Nyl.

Lichenes Novae Zelandiae: 112 (1888).

PHILIPPINES: Palawan; Brookes Point; leg.: Sipman & Tau 29900, IV. 1991 (B).

Major substances: arthothelin, thuringione; minor substances: 4,5-dichloronorlichexanthone, 4,5-dichloro-3-*O*-methylnorlichexanthone.

19. *Buellia metaleptodes* (Nyl.) G. Pant & Awasthi

Proc. Indian Acad. Sci. Plant Sci: 383 (1989).

≡ *Lecidea metaleptodes* Nyl.

Acta Soc. Sci. Fennica 26(10): 15 (1900).

Syn.: *Catillaria metaleptodes* (Nyl.) Zahlbr.

Cat. Lich. Univ. 4: 57 (1926).

SRI LANKA: Ceylon, Paradenija; leg.: E. Almqvist, XII. 1879 (holotype - S).

Major substances: norstictic acid, thiophaninic acid; minor substances: 2,4-dichlorolichexanthone, connorstictic acid.

PHILIPPINES/NORTH LUZON: Mountain province, between Mount Data and Bontoc, on *Alnus* spec., 1750 m, leg.: K. Kalb & A. Schrögl 12411, VIII. 1983 (KALB).

Major substance: norstictic acid; minor substances: connorstictic acid, methyl pseudonorstictate, 2-chlorolichexanthone, 2,4-dichlorolichexanthone, 2-chloro-6-*O*-methylnorlichexanthone, thiophaninic acid.

20. *Buellia montana* H. Magn.

Bot. Not. 1954(2): 199 (1954).

MEXICO/CHIAPAS. Road to „Aqua azul", *ca*. 30 km SW of Palenque. 200 m, leg.: K. Kalb & G. Plöbst 10787, I. 1979 (KALB).

Trace substance: myeloconone D1.

KENYA/CENTRAL PROVINCE: Nyeri District, Road from the Aberdare Mountains to Nyeri; leg.: K. Kalb & A. Schrögl 13746, VIII. 1985 (KALB).

Trace substance: myeloconone D1.

21. *Buellia multispora* Kalb & Vezda

Folia Geobot. Phytotax. 14: 203 (1979).

HAWAII: Dry thicket along coast, Keawaula Valley, Oahu, on living trunks of exotic *Leucaena*; leg.: O. & I. Degener 34257, III. 1977 (isotype - KALB).

Major substance: 4,5-dichlorolichexanthone; minor substances: atranorin, myeloconone D1, unknown secalonic acid derivative.

22. *Buellia natalensis* Vainio

Ann. Univ. Fenn. Ser. A, 2(3): 16 (1926).

SOUTH AFRICA/NATAL: Howick, on bark of *Combreti*; leg.: P. A. van der Bijl 221, 1920 (holotype - TUR).

Major substance: atranorin; trace substance: myeloconone D2.

23. *Buellia pachnidisca* R. C. Harris

Evansia 5(3): 43 (1988).

USA/FLORIDA: Seminole County, on cypress (*Taxodium*); leg.: S. Rapp ex FLAS F30564, VIII. 1930 (isotype - NY).

Major substance: thiophanic acid; minor substances: arthothelin, 3-*O*-methylthiophanic acid.

24. *Buellia placodiomorpha* Vain.

Acta Soc. Fauna Flora Fennica 7: 172 (1890).

BRAZIL/SÃO PAULO: Ilha de São Sebastião, *ca.* 130 km E of São Paulo, Baía dos Castelhanos, on deciduous trees in open situation along the beech, 2 m, leg.: K. Kalb & G. Plöbst 17790, IV. 1979 (KALB).

Trace substance: myeloconone D1.

25. *Buellia pleiotera* Malme

Ark. Bot. 21 A(14): 18 (1927).

BRAZIL/MATO GROSSO: Cuyabá, on bark in a 'cerrado'; leg.: G. O. Malme 2027 B, XII. 1893 (holotype - S).

AUSTRALIA/QUEENSLAND: Sunshine Coast, *ca.* 100 km N of Brisbane, close to Minyama, near the beach; leg.: K. & A. Kalb 19774, VIII. 1988 (KALB).

Major substance: norstictic acid; minor substances: connorstictic acid, methyl pseudonorstictate.

Although MALME states in the protologue that the thallus of this species is K-, we have found norstictic and connorstictic acids in the type specimen by TLC. This species is very similar to *B. bahiana*, but *B. pleiotera* differs in having polyspored asci.

26. *Buellia rechingeri* Zahlbr.

Denkschr. k. Akad. Wiss. Wien, math.-nat. Kl. 81: 78 (1907).

SAMOA: Island of Sawai, beach between Assau and Sataua, on *Cocos nucifera*; leg.: K. & L. Rechinger 2841, 1905 (holotype - W).

Major substance: norstictic acid; minor substance: connorstictic acid.

27. *Buellia rubifaciens* R. C. Harris

Evansia 5 (3): 44 (1988).

USA/FLORIDA: Franklin County, hardwoods along Owl Creek, Hickory Landing Recreation Area, *ca.* 2 mi S of Sumatra; leg.: R. C. Harris 11277, V. 1976 (holotype - NY).

Major substance: thiophanic acid; minor substances: 3-*O*-methylthiophanic acid, arthothelin, eumitrin F, myeloconone A2, fumarprotocetraric acid.

Myeloconone A2 (MCCARTHY & ELIX 1996) and eumitrin F are yellow pigments of unknown chemical structure. Eumitrin F is the major yellow pigment present in *Parmotrema immiscens* (Nyl.) Kurok., and is structurally closely related to eumitrin B (YANG *et al.* 1973).

28. *Buellia sanguinariella* var. *ferruginascens* Malme

Ark. Bot. 21 A (14): 16 (1927).

HAWAII/OAHU: Pupukea, on dead *Acacia koa* in open forest of introduced *Eucalyptus* and *Mimusops*; leg.: O. & I. Degener 30088, VIII. 1965 (M).

Major substance: thiophanic acid; minor substances: arthothelin, chiodectonic acid.

29. *Buellia serotina* Malme

Ark. Bot. 21 A (14): 40 (1927).

BRAZIL/MATO GROSSO DO SUL: *ca.* 41 km south of Campo Grande, in a 'cerrado', 550 m, leg.: K. Kalb 28941, XI. 1979 (KALB).

Major substance: lobaric acid; minor substances: sublobaric aid, secalonic acid X2.

BRAZIL/MINAS GERAIS: Serra do Espinhaço, near Diamantina, in a steppe with large sandstone boulders, 1450 m, leg.: K. Kalb & G. Plöbst 28572, VII. 1978 (KALB).

Major substance: lobaric acid.

BRAZIL/PIAUÍ: Parque National de Sete Cidates, just in front of the entrance to the park, 300 m, leg.: K. & A. Kalb 27119, VIII. 1993 (KALB).

Major substance: lobaric acid; minor substances: sublobaric aid, secalonic acid X2.

Secalonic acid X2 is a yellow pigment of unknown constitution, structurally related to secalonic acid A.

30. *Buellia subpulcella* Vain.

Lich. Mozambici: 7 (1929).

BRAZIL/SÃO PAULO: between São Lourenço and Juquií, *ca.* 65 km W of São Sebastião, at the Rio Guaratuba in a mangrove, 1 m, leg.: K. Kalb 28976, II. 1980 (KALB).

Major substance: thiophanic acid; minor substances: arthothelin, atranorin, dissectic acid, 3-*O*-methylthiophanic acid, unknown pigments.

We have studied the type of this pantropical species, but it was too small for sound chemical analysis. However, the specimen cited is identical with the type material.

31. *Buellia termitophila* Malme

Ark. Bot. 21 A (14): 23 (1927).

BRAZIL/MATO GROSSO: between Aricá and Serra da Chapada, on a termite's nest in a 'cerrado'; leg.: G. O. Malme 2288, I. 1894 (lectotype - S; here selected).

Major substance: norstictic acid; trace substances: myeloconone D1, myeloconone D2.

BRAZIL/MATO GROSSO: Cuyabá, on a termite's nest, in a 'cerrado'; leg.: G. O. Malme 2077, XII. 1893 (W).

Major substance: norstictic acid; minor substance: atranorin.

32. *Buellia turgescens* Tuck.

Genera Lichenum: An arrangement of the N.-American Lichens: 185 (1872).

USA/MASSACHUSETTS: leg.: Tuckerman 1856 (isotype - H).

Major substance: confluentic acid; minor substances: superconfluentic acid, unknown pigment.

This is the first reported occurrence of confluentic acid in *Buellia* sensu lato. Indeed, the thallus of this species is so unique that it is not likely to be confused with any other species in *Buellia* sensu lato. After a careful check, we are convinced that the ascocarpia and the thallus belong to one and the same species and are not due to a lichenicolous fungus parasitizing the lichen thallus. Although we have found filiform conidia to be present, until the taxonomy and chemistry of *Amandinea* is fully understood, we hesitate to propose a formal combination. Moreover, there are other species of *Buellia* sensu lato such as *B. placodiomorpha* (KALB 1982) which have filiform conidia but clearly do not belong to *Amandinea*.

33. ***Buellia vaccinii*** **Vain.**

Philipp. Journ. Sci., sect. C, 8(2): 111 (1913).

MASKARENE ISLANDS/RÉUNION: Ascent from Piton Doré to Piton Textor, several kilometers S of la Plaine-des-Palmistes, in a *Cryptomeria japonica*-forest, *ca.* 1500 m, leg.: K. & A. Kalb 27448, VIII. 1991 (KALB).

Major substances: thiophanic acid, 3-*O*-methylthiophanic acid; minor substance: arthothelin.

The thallus structure, spore size and shape of the apothecia are distinctive for this species, but the type material was very scanty. However, we have carefully compared the above specimen with the type and have found them to be identical in all respects.

34. *Buellia wheeleri* R. C. Harris

Evansia 5(3): 45 (1988).

USA/FLORIDA: Polk County, Bok Tower Gardens, Lake Wales, in scrub; leg.: E: Wheeler s. n. (holotype - NY).

Major substance: unknown pigment; minor substances: secalonic acid A, unknown eumitrin derivatives.

35. *Buellia xylographella* (Nyl.) Zahlbr.

Cat. Lich. Univ. 7: 431 (1931).

≡ *Lecidea xylographella* Nyl.

Lichenes Japoniae: 79 (1890).

SOUTH AFRICA: on fruit trees near Lydenburg in Transvaal; leg.: F. Wilms s. n. (B).

Major substances: unknown pigments; minor substance: atranorin.

Like many of Nylander's type specimens, this one was too small for chemical analyses. Therefore we have taken material from the extensive collections made by Wilms (see above) which are identical with the type material in every respect.

36. *Buellia xylophila* Malme

Ark. Bot. 21 A (14): 17 (1927).

BRAZIL/MATTO GROSSO: Santa Anna da Chapada, leg. G. Malme 2370, II. 1894 (lectotype - S; here selected).

Major substance: unknown cf. dissectic acid; minor substance: myeloconone D1.

37. *Buellia zahlbruckneri* Steiner

Ann. Naturhist. Hofmus. Wien 23: 122 (1909).

CYPRUS: Troodos Mountains; footpath around Mount Olympus, on *Pinus nigra*, 1800 m, leg.: K. & A. Kalb 15814, V. 1986 (KALB).

Major substance: 6-*O*-methylarthothelin; minor substances: atranorin, methyl β-orsellinate, 5-hydroxy-β-orsellinic acid.

While the xanthone, 6-*O*-methylarthothelin, was found in all of European collections tested (Herb. K. KALB) and has been reported previously for this species (HUNECK *et al.* 1992), atranorin and the related β-orcinol derivates seem to be accessory metabolites.

38. *Buellia* spec. (*epiflavia*)[1]

BRAZIL/MATO GROSSO DO SUL: near Bandeirantes, *ca.* 72 kilometers N of Campo Grande; in a 'cerradão', 700 m, leg.: K. Kalb 28993, XI. 1979 (isotype - KALB).

Major substance: norstictic acid; minor substances: atranorin, connorstictic acid, lichexanthone.

39. *Buellia* spec. (*mediospora*)

ECUADOR/AZUAY: *ca.* 35 kilometers S von Cuenca, in remnants of a forest in a grass paramo, 3200 m, leg.: K. Kalb 18365, VIII. 1987. (holotype - KALB).

Major substance: 6-*O*-methylarthothelin; minor substance: myeloconone D1.

40. *Buellia* spec. (*omalia*)

COSTA RICA/CARTAGO: S-slope of volcan Irazú, along the road from Cartago to the top, near entrance of National Park, pasture land with tall trees, on tree trunk; leg.: H. Sipman 12386, I. 1979 (holotype - B).

Major substance: fumarprotocetraric acid; minor substances: confumarprotocetraric acid, protocetraric acid, unknown pigment.

41. *Gassicurtia coccinea* Fée

Essai crypt. écorces officin.: 100 (1825).

FRENCH GUAYANA: leg.: Leprieur 287 (G).

Major substance: thiophaninic acid; minor substances: chiodectonic acid, 4-chlorolichexanthone, unknown secalonic acid derivative.

Unfortunately the type material of this species (G) is thought to be lost and the isotypes (PC) have not been made available despite several requests. APTROOT (1987a), who has studied the type chemically (pers. comm.), but has not published the results, cites *B. sanquinariella* as a synonym. We have analyzed the holotype of *B. sanguinariella* and found that it has the same chemistry as *G. coccinea*. Therefore we are confident that we have assigned the correct chemistry to this species.

---

[1] Species names in brackets refer to Marbach (1998) where these species will be treated in more detail but not necessarily accomodated in *Buellia* sensu stricto.

42. *Gassicurtia* spec. (*acidobaeomycea*)

BRAZIL/SANTA CATARINA: Ilha de Santa Catarina, north-western part, Praia do Forte, in a 'restinga', 3 m, leg.: K. Kalb 28712, V. 1980 (holotype - KALB).

Major substance: thuringione; minor substances: arthothelin, atranorin, baeomycesic acid, 3-*O*-methylthiophanic acid, squamatic acid, thiophanic acid.

43. *Gassicurtia* spec. (*coccifera*)

BRAZIL/MATO GROSSO: Serra dos Coroados, between Cuiabá and Buriti, in a 'cerrado', 500 m, leg.: K. Kalb 28718, VII. 1980 (holotype - KALB).

Major substance: lobaric acid; minor substance: chiodectonic acid.

44. *Gassicurtia* spec. (*coccinoides*)

BRAZIL/MATO GROSSO: between Boa Vista and São Lourenço, *ca.* 15 kilometers NW of Rondonopolis, in a 'cerradão', 250 m, leg.: K. Kalb 28708, VI. 1980 (holotype - KALB).

Major substance: boryquinone; minor substances: chiodectonic acid, 4,5-dichlorolichexanthone, secalonic acid X2.

45. *Gassicurtia* spec. (*manguensia*)

BRAZIL/SÃO PAULO: Praia de Peruibe near Itanhaém, in a dense mangrove, 2 m, leg.: K. Kalb 28719, VII. 1980 (holotype - KALB).

Major substance: thiophanic acid; minor substances: arthothelin, 3-*O*-methylthiophanic acid, unknown pigment.

46. *Gassicurtia* spec. (*pseudosubpulcella*)

COSTA RICA/PUNTARENAS: Fila Cruzes Ridge, surroundings of „Las Cruzes Tropical Botanical Garden", ca. 4 km SSE of San Vito; leg.: K. Kalb & G. Plöbst 28697, XII. 1978 (holotype - KALB).

Major substance: unknown pigment; minor substances: arthothelin, 3-*O*-methylthiophanic acid, thiophanic acid.

47. *Lecanora insperata* Nyl.

Acta Soc. Sci. Fenn. 7: 443 (1863).

≡ *Lecidea insperata* (Nyl.) Nyl.

Flora 63: 128 (1880).

≡ *Rinodina insperata* (Nyl.) Malme

Bih. Kongl. svenska Vet.-Akad. Handl. 28, afd. 3(1): 44 (1902).

URUGUAY/CANELONES: Parque National de F. D. Roosevelt; leg.: B. Marbach & H. Osorio s. n., VIII. 1995 (KALB).

Major substance: atranorin.

The spores of this species are so characteristic (i. e. brown and polarilocular) that a chemical study of the lectotype (which we have seen), was not necessary.

Typification of the genus *Buellia*

It is obvious that before any systematic decisions can be made, a type species and a type specimen has to be selected for the genus *Buellia*. The first typification was made by CLEMENTS & SHEAR 1931: 323. Usually their choises are not regarded as a "mechanical method of selection" (ICBN-Tokyo, art. 10.5.) and therefore have to be followed (if no other errors had been made). CLEMENTS & SHEAR (loc. cit.) have selected *Buellia parasema* as type species and as this is one of the species mentioned by DE NOTARIS 1846, their choise must be regarded as correct. According to art. 58.3 of the "Tokyo-Code", we can treat *Buellia parasema* de Not., which is legitimate, as the name of a new taxon and not as a new combination. Subsequently, we have selected a specimen from the DE NOTARIS herbarium (R) as lectotype. Two pieces of bark supporting the same lichen species are glued to the sheet, and we have selected the larger specimen on the left hand side of the sheet as the lectotype. This specimen is accompanied by drawings and annotations made by DE NOTARIS himself and is most probably one of the specimens which the author used for his description.

We have investigated this specimen anatomically and chemically as well as the lectotype specimen of *B. disciformis* (Fries 215A - UPS, central specimen; lectotype selected here). It must be noted that there are two other *Buellia* specimens on the same piece of bark, growing on the left and the right, which belong to another species. Interestingly we recognized that *B. parasema* de Not. is not a synonym of *B. disciformis* (Fr.) Mudd, but most probably an earlier synonym for *B. triphragmia* (Nyl.) Arnold. Although we have not studied the type of the latter, we have compared de Notaris' specimen with material in herb. KALB, e. g. Kryptogamae exsiccatae 2178: *Buellia disciformis* var. *triphragmia*; Plantae Graecenses, Lich. 187: *Buellia triphragmia*; Norway/Nordland: Rombaksfjord near Narvik, between Öyjord and Lenvik, on *Salix*, ca. 125 m, leg.: K. Kalb 15333, VIII. 1970: *Buellia triphragmia*; and Anzi: Lich. ex. Ital. 295 (M): *Buellia parasema* var. *minor*. All these specimens are morphologically and chemically more or less identical, i. e. the hymenium is inspersed with oil drops, the spores measure 18-26 x 7-9 µm and the spore walls are thinner at their ends than at the sides and a few spores show a tendency to become four-celled. Great care must be taken when observing the latter character, because when maturing, the lumina of the spores are often divided by plasma bridges and not by true septa. This is best seen when adding astrablue-diamond fuchsin and heating to the slide. While the spore plasma (including the pseudosepta) stains deep red, the true spore septa remain more or less colourless.

Chemistry: [lectotype of *Buellia parasema* - R], major substance: atranorin; minor substances: norstictic acid, dissectic acid, methyl β-orsellinate, 6-*O*-methylarthothelin, brialmontin 1, brialmontin 2, fulgidin (trace); [*Buellia parasema* var. *minor*, Anzi: Lich. ex. Ital. 295 (M)] had the same chemistry as the lectotype above, but higher concentrations of fulgidin (minor) were observed in this specimen. Atranorin (major), dissectic acid (minor), fulgidin (minor/trace), brialmontin 1 (minor/trace) and brialmontin 2 (minor/trace) were observed in all specimens of this species examined, but the other minor components appear to be accessory in nature.

B. disciformis on the other hand has clearly callisporoid spores with a different length-width-index (16-22 x 8-10 µm) and a different chemistry: major substance: atranorin, minor substances: fulgidin, fulgoicin and norfulgoicin (GIRALT 1996).

Our proposed lectotypification of the type specimens for *Buellia parasema* and *Buellia disciformis* avoids almost any nomenclatural changes. What we cannot exclude however before having seen the type of *B. triphragmia* and studied much more material of the *disciformis-triphragmia*-group, is that both species are still treated in a collective sense (i.e may comprise a species complex).

Buellia de Notaris
Giorn. Bot. Italiano II. 1.1: 195 (1846).
Lectotype of the genus (selected by Clements & Shear 1931: 323):
Buellia parasema de Not.
Giorn. Bot. Italiano II. 1.1: 198 (1846).
Lectotype specimen (selected here):
Lecidea parasema (left specimen) ex agro Comensi (= near Como); leg.: Garovaglio (R-de Not.).

ACKNOWLEDGEMENTS

We thank the keepers of the herbaria mentioned for the loan of the type material used in this study. Special thanks go to Dr. B. Marbach, who allowed us to use the provisional names of the new species which will be described in his monograph (MARBACH 1998), Prof. Rolf Santesson for helpful comments on the typification of the genus *Buellia* and to Mrs J. H. Wardlaw for assistance with HPLC. JAE would like to thank the Australian Biological Resources Study for generous financial support.

LITERATURE CITED

APTROOT, A. 1987a. Pyxinaceae (Lichens). - Flora of the Guianas. Ser. E: Fungi and lichens, Fasc. 1: 1-59.

APTROOT, A. 1987b. Proposal to conserve *Buellia* De Not. against *Gassicurtia* Fée (lichenized fungi, Pyxinaceae). - Taxon 36: 474.

BRODO, I. M. 1968. The lichens of Long Island, New York: A vegetational and floristic analysis. - New York State Mus. Sci. Serv. Bull. 410: 1-330.

BÜDEL, B. & ELIX, J. A. 1997. *Peltula langei* Büdel et Elix spec. nov. from Australia, with remarks on its chemistry and the ascoma of *Peltula clavata* (Krempelh.) Wetm. - Bibl. Lich. 67: 3-9.

CLEMENTS, F. E. & SHEAR, C. L. 1931. The genera of fungi, 2nd ed. New York, 496 pp.

CULBERSON, C. F. 1972. Improved conditions and new data for the identification of lichen products by a standardized thin layer chromatographic method. - J. Chromatogr. 72: 113-125.

DE NOTARIS, G. 1846. Frammenti lichenografici. - Giorn. Bot. Italiano II. 1.1: 174-224.

DODGE, C. W. 1953. Some lichens of tropical Africa. - Ann. Missouri Bot. Garden 40(4): 271-401.

ELIX, J. A. 1998. Unpublished data.

ELIX, J. A. & ERNST-RUSSELL, K. D. 1993. Wintabolites - A catalogue of standardized thin layer chromatographic data and biosynthetic relationships for lichen substances. Canberra, 163 pp.

ELIX, J. A., CHAPPEL, H.-M. & JIANG, H. 1991. Four new lichen xanthones. - Bryologist 94: 304-307.

ELIX, J. A., JIANG, H. & PORTELLI, V. J. 1990. Structure and synthesis of the lichen xanthone isoarthothelin (2,5,7-trichloronorlichexanthone). - Aust. J. Chemistry 43: 1291-1295.

ELIX, J. A., WARDLAW, J. H., ARCHER, A. W., LUMBSCH, H. T. & PLÜMPER, M. 1997. Four new depsidones from *Pertusaria* and *Lecanora* lichens. - Australasian Lichenology 41: 22-27.

FÉE, A. 1825 ['1824']. Essai sur les cryptogames des écorces exotiques officinales. Paris, 152 pp.

FEIGE, G. B., LUMBSCH, H. T., HUNECK, S. & ELIX, J. A. 1993. The identification of lichen substances by a standardized high-performance liquid chromatographic method. - J. Chromatogr. 646: 417-427.

GIRALT, M. 1996. Notes on some corticolous Buellia species from the Iberian Peninsula. - Poster presented at IAL 3 Symposium, Salzburg, Austria, 1-7 September, 1996 (Symposium Abstracts p. 103).

HARPER, S. H. & LETCHER, R. M. 1966. Chemistry of lichen constituents. Part I. Some constituents of *Acarospora schleicheri, Buellia rhodesiaca, Caloplaca cinnabarinum, Dermatiscum thunbergii, Parmelia dilatata, Parmelia grossweileri, Pertusaria* species (L 19), *Temnospora fulgens* and *Usnea implicata*. - Proc. Trans. Rhodesian Sci. Assoc. 51: 156-184.

HARRIS, R. C. 1988. *Buellia* in north and central Florida or the virtues and rewards of collecting. - Evansia 5(3): 37-45.

HARRIS, R. C. 1990. Some Florida lichens. - Publ. by the author. Bronx, N. Y., 109 pp.

HARRIS, R. C. 1995. More Florida lichens including the 10¢ tour of the pyrenolichens. - Publ. by the author. Bronx, N. Y., 192 pp.

HUNECK, S. & SIEGEL, M. 1963. Über das Vorkommen von Norstictsäure *in Buellia sororiodes* Erichsen. - Naturwissenschaften 50: 154-155.

HUNECK, S., JOHN, V., JAKUPOVIC, J. & ELIX, J. A. 1992. Zur Chemie einiger Strauch- und Krustenflechten aus der Türkei. - Herzogia 9: 173-179.

IMSHAUG, H. A. 1955a. The lichen genus *Buellia* in the West Indies. - Farlowia 4(4): 473-512.

IMSHAUG, H. A. 1955b. The lichen genus *Buellia* in Central America. - Bryologist 58: 277-287.

KALB, K. 1982. Lichenes Neotropici, Fasc. 3, no. 1.

LEUCKERT, C. & MATHEY, A. 1975. Beiträge zur Chemotaxonomie einiger Xanthon-haltiger Arten der Flechtengattung *Buellia*. - Herzogia 3: 461-488.

MALME, G. O. A. 1902. Die Flechten der ersten Regnell'schen Expedition. II. Die Gattung *Rinodina* (Ach.) Stiz. - Bih. Kongl. svenska Vet.-Akad. Handl. 28, afd. 3(1): 1-53.

MALME, G. O. A. 1927. *Buelliae* itineris Regnelliani primi. - Ark. Bot. 21 A(14): 1-41.

MARBACH, B. 1998. Corticole und lignicole Arten der Flechtengattung *Buellia* sensu lato in den Subtropen und Tropen. - Bibl. Lich., in press.

MCCARTHY, P. M. & ELIX, J. A. 1996. *Myeloconis*, a new genus of pyrenocarpous lichens from the tropics. - Lichenologist 28: 401-419.

MÜLLER ARG., J. 1893. Lichenes exotici. II. - Hedwigia 32: 120-136.

MÜLLER ARG., J. 1894. Conspectus systematicus lichenum Novae Zelandiae. - Bull. Herb. Boissier II, appendix 1: 1-114.

NYLANDER, W. 1861. Expositio lichenum Novae Caledoniae. - Ann. Sci. Nat. 4(15): 37-54.

NYLANDER, W. 1863. Lichenographiae Novo-Granatensis prodromus. - Acta Soc. Sci. Fenn. 7: 415-504.

NYLANDER, W. 1869. Lichenes Kurziani Bengalienses. - Flora 52: 69-73.

NYLANDER, W. 1880. Lichenes nonnulli insulae S. Thomae Antillarum. - Flora 63: 127-128.

NYLANDER, W. 1888. Lichenes Novae Zelandiae. Paris, 157 pp.

NYLANDER, W. 1890. Lichenes Japoniae. Accedunt observationibus lichenes insulae Labuan. Paris, 122 pp.

SCHEIDEGGER, C. & RUEF, B. 1988. Die xanthonhaltigen, gesteinsbewohnenden Sippen der Flechtengattung *Buellia* De Not. (Physciaceae, Lecanorales) in Europa. - Nova Hedwigia 47(3-4): 433-468.

SIPMAN, H. J. M. 1992. Results of a lichenological and bryological exploration of Cerro Guaiquinima (Guayana Highland, Venezuela). - Tropical Bryology 6: 1-31.

STEINER, J. 1909. Lichenes. in: HANDEL-MAZZETTI, H. von. Botanische Reise in das Pontische Randgebirge. - Ann. k. k. Naturhist. Hofmus. Wien 23: 107-123.

STIRTON, J. 1876. Foreign lichens. - Trans. Glasgow Soc. Field Nat. 4: 165-168.

STIRTON, J. 1877. Additions to the lichen flora of New Zealand and the Chatham Islands. - Proc. Phil. Soc., Glasgow 10: 292-306.

STIRTON, J. 1879. New and rare lichens from India and the Himalayas. - Proc. Phil. Soc., Glasgow 11(2): 306-322.

TUCKERMAN, E. 1858. Supplement to an Enumeration of North American Lichenes; Part first, containing brief diagnoses of new species. - Amer. Journ. Sci. and Arts, ser. 2. 25: 422-430.

TUCKERMAN, E. 1862. Observations on North American and other lichenes. - Proc. Amer. Acad. Arts and Sci. 5: 383-422.

TUCKERMAN, E. 1864. Observationes lichenologicae. Observations on North American and other lichenes. - Proc. Amer. Acad. Arts and Sci. 6: 263-287.

TUCKERMAN, E. 1866. Lichens of California, Oregon and the Rocky Mountains; so far as yet known. Amherst, Mass., 35 pp.

TUCKERMAN, E. 1872. Genera lichenum: An arrangement of the North American lichens. Amherst, Mass., 281 pp.

TUCKERMAN, E. 1888. A synopsis of the North American lichens: Part II., comprising the Lecideaci, and (in part) the Graphidacei. New Bedford, 176 pp.

VAINIO, E. A. 1890. Étude sur la classification naturelle et la morphologie des lichens du Brésil, I. - Acta Soc. Fauna Flora Fennica 7: 1-247.

VAINIO, E. A. 1913. Lichenes insularum Philippinarum. II. - Philipp. Journ. Sci., sect. C, 8(2): 99-137.

VAINIO, E. A. 1929. Lichenes Mozambici. - Coimbra, 38 pp.

YANG, D-M, TAKEDA, N., IITAKA, Y., SANKAWA, U. & SHIBATA, S. 1973. The structures of eumitrins A1, A2 and B. The yellow pigments of the lichen, *Usnea bayleyi* (Stirt.) Zahblr. - Tetrahedron 29: 519-528.

ZAHLBRUCKNER, A. 1907. Die Flechten der Samoa-Inseln. in: RECHINGER, K. Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoa-Inseln, dem Neuguinea-Archipel und den Salomons-Inseln von März bis Dezember 1905. - Denkschr. k. Akad. Wiss. Wien, math.-nat. Kl. 81: 26-91.

ZAHLBRUCKNER, A. 1926-1927. Catalogus lichenum universalis 4. Leipzig, 754 pp.

ZAHLBRUCKNER, A. 1930-1931. Catalogus lichenum universalis 7. Leipzig, 784 pp.

ZAHLBRUCKNER, A. 1931. Neue Flechten X. - Ann. Mycol. 29: 75-86.

MYCOTAXON

Volume LXVIII, pp. 483-491 July-September 1998

A NEW SPECIES OF ECHINODONTIUM FROM ITALY

Annarosa Bernicchia

Istituto di Patologia Vegetale, Università degli Studi di Bologna,
Via F.Re 8, I-40126 Bologna, Italia.
E-mail: abernicc@pop.agrsci.unibo.it

Andrea Piga

Viale Marconi 47, I-08045 Lanusei (Nuoro), Italia.

ABSTRACT

Echinodontium ryvardenii is described as a new species. It is characterized by conchate, effuse-reflexed or resupinate basidiocarps, toothed hymenophore, presence of blackish resinous line next to the substratum, clamped hyphae, incrusted cystidia, amyloid, ellipsoid and warted-rough basidiospores.

Key words: *Echinodontium*, Echinodontiaceae, wood-inhabiting fungi.

INTRODUCTION

The genus *Echinodontium* Ellis & Everh. includes six species according to Gross (1964) or five species according to Ryvarden et al. (1976) and Ryvarden (1991) who exclude *Laurilia sulcata* (Burt) Pouzar. This species has a circumpolar

distribution in the boreal conifer zone, while the other ones are extra-European as follows:
E. ballouii (Banker) Gross growing on *Chamaecyparis thyoides* is known only from New Jersey and has not been collected since 1909; *E. japonicum* Imazeki growing on *Quercus* spp. is known from Japan; *E. taxodii* (Lenz & Mckay) Gross growing on different hosts is known from U.S.A., Japan and Taiwan; *E. tinctorium* (Ellis & Everh.) Ellis & Everh. growing on coniferous trees in the west part of North America from Mexico to Alaska; *E. tsugicola* (Henn. & Shirai) Imazeki growing on *Tsuga* spp. and *Abies firma* Sieb. & Zucc. is known from Japan.

At the end of 1997 we collected a peculiar toothed, conchate polypore growing on the trunk of old *Juniperus phoenicea* L. in two different localities in Sardinia.

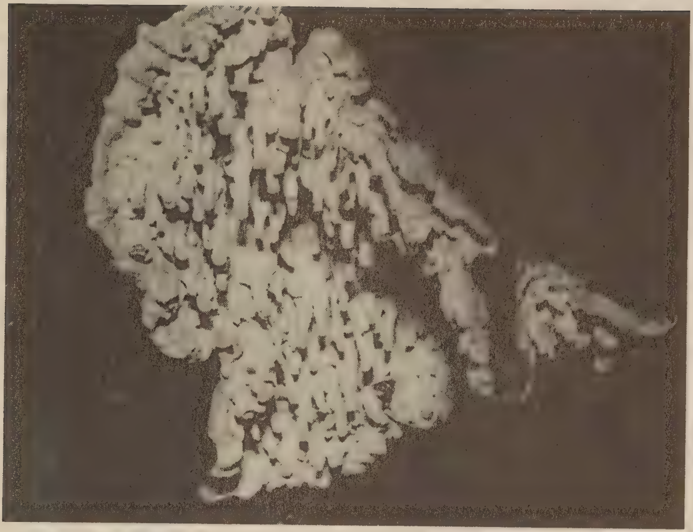
Our species has all the characteristic features of *Echinodontium* and on the basis of macro- and microscopic characteristics is placed between *E. japonicum* and *E. tsugicola.* However, the lack of a brick red context immediately separates *E. ryvardenii* from *E. tsugicola* while the absence of olive greyish colour in the sterile surface, context and hymenophore sets it apart from *E. japonicum.* The silvery colour, the woody consistency, the dentate hymenophore, the encrusted cystidia and the amyloid basidiospores are distinctive and confirm that *E. ryvardenii* is a well-defined species, separate from all other known European and extra-European species.

***Echinodontium ryvardenii* Bernicchia & Piga sp. nov.**
Etymology: dedicated to Professor Leif Ryvarden

(Figs 1- 6)

Carposomata lignea, perennia(?), conchata, effuso-reflexa, aliquanto resupinata. Pileus tomentosus, rugosus, zonatus, colore brunneo-fusco, margine pallido. Superficies dentata, aculeis et tuberculis sparsis, colore cineraceo-argenteo. Linea subnigra prope substratum adest.

Systema hypharum dimiticum: hyphae generativae hyalinae,



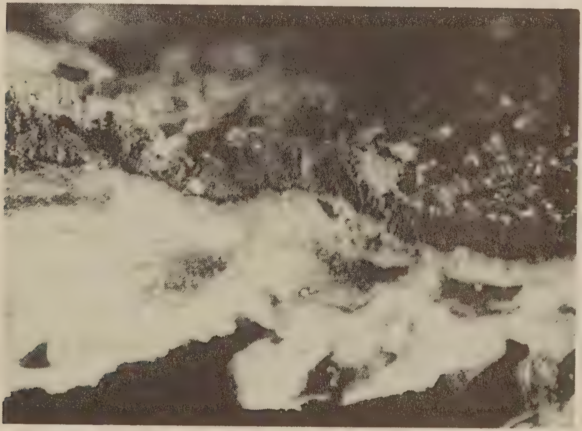


Fig. 1. Basidiocarps of *Echinodontium ryvardenii*, coll. 6908 (Photo F.Padovan).

Fig. 2. Section through the fruitbody showing the blacking resinous line close to the substratum, coll. 6907 (x 36).

ramosae, fibulatae et septatae, tenuitunicatae vel leviter crassitunicatae, 2-3.5 µm latae; hyphae skeletales 3.0-5.5 µm latae, crassitunicatae vel solidae, rectae vel flexuosae nonnumquam ramosae. Cystidia copiosa, hyalina postea brunnea, clavata vel fusoidea, tunica furfuracea brunnea obducta. Basidia hyalina, clavata, sinuosa, 30-40 x 6-7(-8) µm lata, 4-sterigmatibus. Basidiosporae hyalinae, amyloideae, ellipticae, leviter crassitunicatae, 6.5-7.5-8.0 x 4.5-5.5(-5.8) µm latae, asperae vel verrucosae.

Holotypus: Italia, Sardegna, on dunes of Capo Comino (Nuoro) 15.XII.97, on trunk and old branches of *Juniperus phoenicea*, Leg. A.Bernicchia, coll. 6907 (HUBO).

Other species examined: collection as the holotypus, Bernicchia (HUBO) 6908 from Lanaittu (Nuoro), m 180 a.s.l., 13.XII.97 on *Juniperus phoenicea*, leg. A.Piga.

Basidiocarps perennial (?), woody, conchate to effused-reflexed, irregularly bell-shaped, rarely resupinate, occurring singly to imbricate, 2-6 x 1-3 x 0.4-0.8 cm (Fig. 1). Sterile surface when present tomentose-rugose, zonate, brown, brown-blackish with paler margins. Margin 1-2 mm wide, pubescent-tomentose, rounded then acute, undulating; under surface warted to toothed; hymenophore dentate, ashen to silvery grey, unchanged when dry; teeth scattered, similar to stalactites, sometimes fused together to form aggregate tubercules, 1-5 mm long and 0.5- 1 mm wide, apices rounded and fertile even if there are few basidia; context firm, zonate, 2-3 mm thick, from pale brown to brown. In cross section there is a blackish layer visible next to the substrate in which the skeletal hyphae are dark brown, thick-walled to solid, rarely clamped and branched, 5.0-6.0 µm in diam (Fig. 2).

Hyphal system dimitic: generative hyphae hyaline, branched, clamped but with the presence of simple septa, with more or less thin walls, 2.0-3.5 µm in diam; skeletal hyphae thick-walled to solid, 3.0-5.5 µm in diam, with few branches, straight to slightly sinuous, rarely clamped, hyaline to pale brown, darkening in

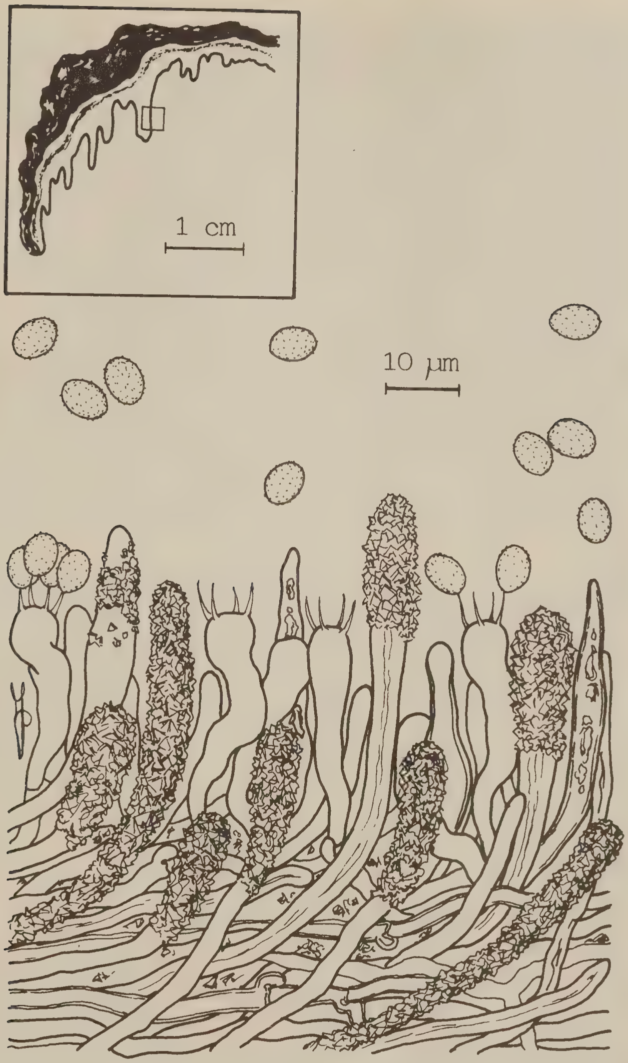
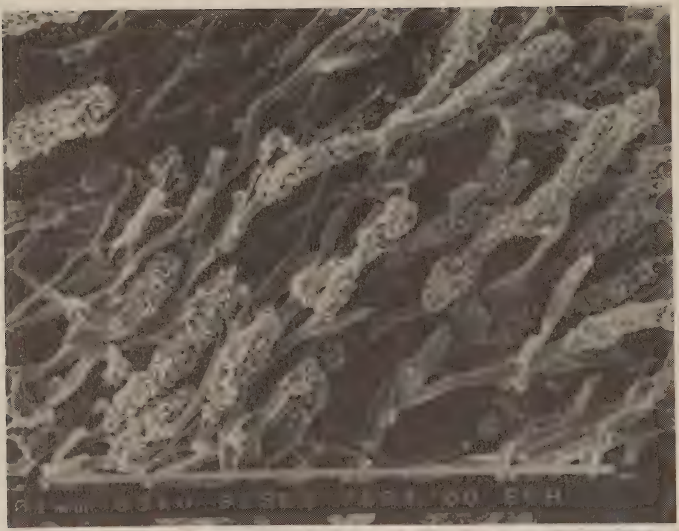


Fig. 3. Hymenial elements of *Echinodontium ryvardenii*, coll. 6907 (drawing by F.Padovan).



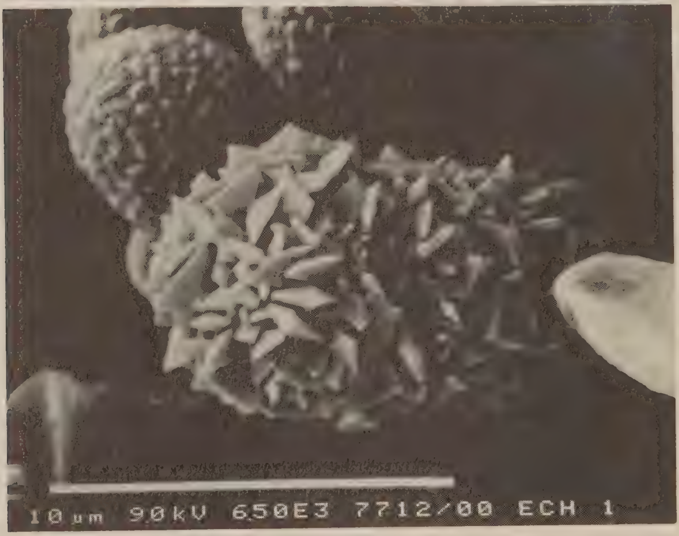

10 μm 90kV 650E3 7712/00 ECH 1

Fig. 4. Fusiform cystidia of *E. ryvardenii* coll. 6907, Scale = 0.1 mm (Photo G.Filippini).

Fig. 5. Club-shaped cystidia of *E. ryvardenii* coll. 6907, Scale = 10 μm (Photo G.Filippini).

KOH solution, darker in the tomentum where they are smooth or lightly encrusted (Fig. 3). Hymenium hyaline, about 60-70 µm thick; subhymenium continuous, up to 200-220 µm thick; cystidia numerous, club-shaped to fusiform (the latter are crowded along the margins, in the smooth areas between the teeth and in the apex of the aculei), hyaline then light brown, darker in KOH, originally thin-walled later thick-walled to solid; upper portions encrusted, the encrusted part 45-50(-70) x 7-8-9 µm. The club-shaped cystidia are evident in the fertile part of the teeth. The crystals have a bi-pyramidal shape. Basidia clavate, sinuous, hyaline, 30-40 x 6-7(-8) µm with 4 sterigmata about 5 µm long. Basidiospores hyaline, ellipsoid, very abundant, 6.5-7.5-8.0 x 4.5-5.5(-5.8) µm, amyloid, with thickened walls, appearing almost smooth under oil immersion, from warted to rough under SEM (Figs. 4-6).

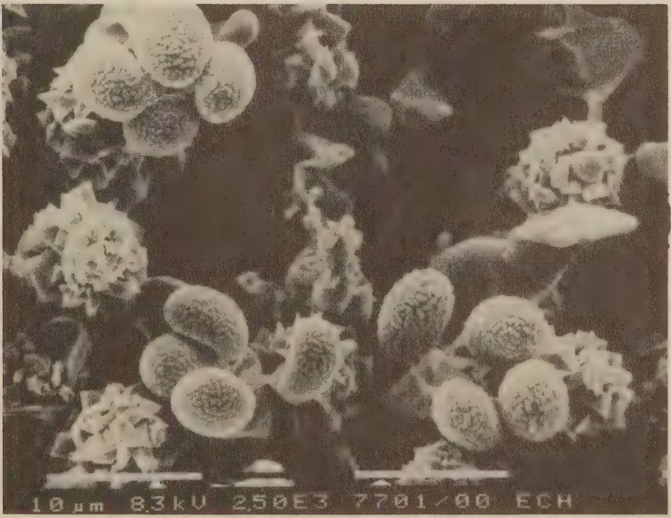


Figure 6. Warted-rough basidiospores of *E. ryvardenii*, Scale = 10 µm (Photo G.Filippini)

Substrate: on trunk and large branches of living *Juniperus phoenicea*. Bell-shape or conchate with a trapezoidal section when growing inside deep ridges of bark; effuso-reflexed and imbricate when growing at branch stubs.

Holotype: on dunes of Capo Comino (Nuoro) where there are few pluricentenarian trees of living *Juniperus phoenicea*, 15.XII.97, leg. A.Bernicchia, coll. 6907 (HUBO).

Other specimens examined: Lanaittu (Nuoro) m 180 a.s.l., in machia forest on *Juniperus phoenicea*, 13.XII.97, coll. 6908 (HUBO), leg. Andrea Piga.

Echinodontium japonicum Imaz., Japan Nara, Kazuga Urayama (type locality), on *Quercus gilva*, 20.10.1976, leg. T.Yokoyama; *E. tsugicola* (Henn. & Shirai) Imazeki, Japan, Hokkaido Esashi-gun, Oct. 1964, on *Tsuga densifolia*, leg. K.Aoshima. These two collections were sent from Professor Ryvarden of Oslo University.

Sardinia is a very interesting area and *E. ryvardenii* can be considered a relict taxon.

Remarks: It is very remarkable that our species is the first European collection of *Echinodontium* while all previous collections are North American or Asiatic. It must be looked upon as a relict of a previously larger distribution. *E. ryvardenii* comes near to *E. tsugicola* but differs in the silvery, pale cinereous hymenophore instead of brown sienna, the absence of a brick red context, the presence of scattered, shorter and thinner teeth, and longer basidiospores. In addition, the basidiocarps of *E. tsugicola* are more stout and woody.

From *E. japonicum* it differs in the presence of conchate basidiocarps, the coniferous habitat, the different size of cystidia, the larger basidiospores, and the absence of deep olive-buff or greyish-olive in the margins, context and hymenophore. In our species there is no trace of olive.

E. ballouii besides being golden-yellow when fresh, has larger basidispores, smaller basidia, and the typical coniferous habitat of *Chamaecyparis thyoides*.

The presence of a conspicuous, undulating dark line near to the substratum is a distinctive character, differentiates *Echinodontium ryvardenii* from the other species of the genus, and makes it close to *Laurilia sulcata*, a corticioid species excluded from *Echinodontium* by many mycologists.

E. ryvardenii could therefore be considered a link between the two genera. If this is true, we should perhaps reconsider the systematic position of *Laurilia sulcata*.

Acknowledgments

We are grateful to Dr F. Padovan and G.Filippini for the illustrations. We deeply acknowledge Dr Peter Roberts for acting as pre-submission reviewer of this article and making valuable suggestions to improve the manuscript.

Literature cited

Eriksson J. and Ryvarden L., 1976 - The Corticiaceae of North Europe. Vol. 4. Fungiflora, Oslo, Norway pp. 787-794.

Gross H.L., 1964 - The Echinodontiaceae. Mycopathol. et Mycol. App., XXIV, 1-26.

Ryvarden L., 1991 - Genera of Polypores. Nomenclature and Taxonomy. Synopsis Fungorum 5, Fungiflora, Oslo, Norway pp. 363.

MYCOTAXON

Volume LXVIII, pp. 493-495 July-September 1998

POWDERY MILDEW ON CONYZA AND COSMOS IN TURKEY

A. KARAKAYA

Ankara University, School of Agriculture, Department of Plant Protection, Diskapi, Ankara, 06110, Turkey

Sphaerotheca fusca on *Conyza canadensis* and *Cosmos* sp., new on these hosts for Turkey, is described and illustrated.

Key words: *Sphaerotheca fusca, Conyza canadensis, Cosmos* sp., Turkey

Powdery mildew symptoms have been observed on plants of *Conyza canadensis* and *Cosmos* sp. growing in the Pursaklar region of Ankara, Turkey. The causal agent of this disease has been identified as *Sphaerotheca fusca* (Fr.) S. Blumer em. U. Braun (Braun, 1987, 1995). The collections concerned are characterized by the following microscopic features:

Mycelium on leaves and stems, gradually turning brown, amphigenous; conidia in chains, ellipsoid to ovoid or doliform, (23)33(48)x(13)18(20) µm (Figure 1); cleistothecia scattered to gregarious, (70)86(108) µm; outer peridial cells irregularly shaped, conspicuous, (11)23(45) µm; cleistothecial appendages mycelioid, septate, occasionally branched, usually dark, hardly separable from the mycelium; ascus sessile, (70)80(103)x(53)58(70) µm; ascospores 8, (18)22(27)x(13)17(20) µm (Figure 2).

Sphaerotheca fusca is known on *Cosmos* spp. from Romania, the former USSR, Asia (India, Japan, China, Korea), the USA, South America and the West Indies and South Africa (Amano, 1986; Braun; 1987, 1995). *Sphaerotheca fusca* on *Conyza canadensis* has been reported from nearly all Europe, N. America (Canada, USA), Asia (Central Asia, China, Japan, India, Iran, Korea, Far East of Russia) and Caucasus (Amano, 1986; Braun, 1987; 1995). This is the first report of *Sphaerotheca fusca* on *Conyza canadensis* and *Cosmos* sp. from Turkey.

Acknowledgements

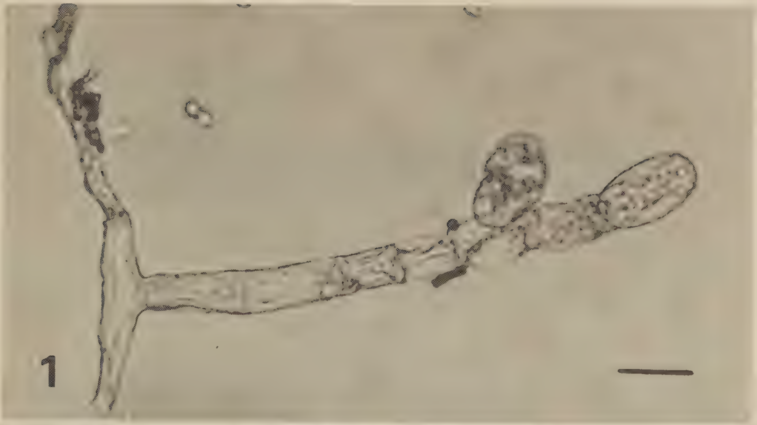
The author thanks Dr.U. Braun, Halle/S., Germany, for his help during the preparation of this paper. Thanks are due to Professor M. Vural and Ms. Z. Güven for their help to identify the host plants.

Literature Cited

Amano, K. 1986. Host range and distribution of the powdery mildew fungi. Japan Scientific Press. Tokyo. 741 pp.

Braun, U. 1987. A monograph of the Erysiphales (powdery mildews). Beih. Nova Hedwigia 89: 1-700.

Braun, U. 1995. The powdery mildews (Erysiphales) of Europe. Gustav Fischer. 219 pp.



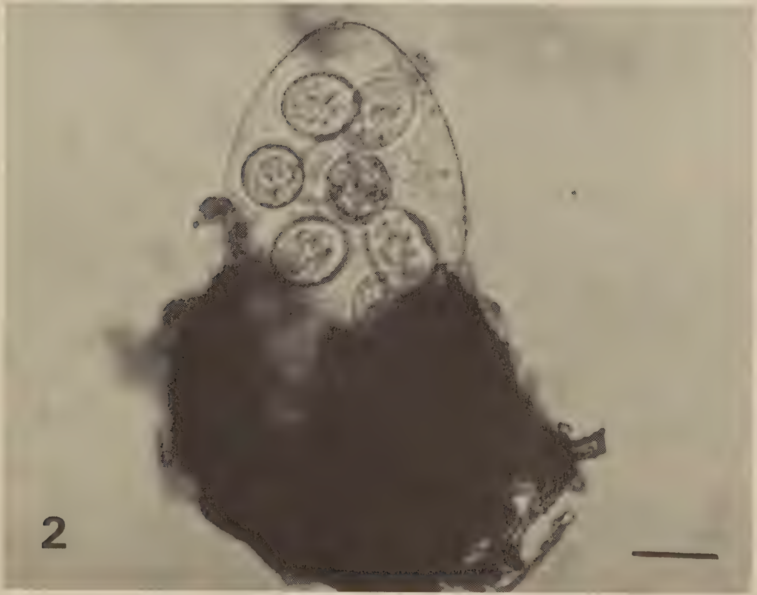


Figure 1) Conidiophore and conidia of *Sphaerotheca fusca*.
Figure 2) Cleistothecium, ascus and ascospores of *Sphaerotheca fusca*. Bar= 20 µm.

MYCOTAXON
Volume LXVIII, pp. 497-498 July-September 1998

COMMENTS ON THE NAMES TRAMETACEAE, CORIOLACEAE, AND TRAMETALES

JACQUES BOIDIN
17 rue Duguesclin, F–69006 Lyon, France
and
RICHARD P. KORF
Plant Pathology Herbarium, Cornell University, Ithaca, NY 14853

In a recent publication (Boidin, Mugnier, and Canales, 1998) two of the new names proposed, the family name Trametaceae Boidin & al., typified by the type of *Trametes* Fr., and the ordinal name Trametales Boidin & al., typified by the type of Trametaceae, require some clarification.

The formal proposal of Trametaceae (Boidin & al. 1998: 487) mentioned but one genus, *Trametes*. From the text (*loc. cit.:* 473) it is clear that Boidin & al. include in the new family not only that genus, but also *Lenzites* Fr. The new family name was proposed because of their mistaken belief that since *Coriolus* Quél. is now treated by them and many other taxonomists as a later synonym of *Trametes*, the family name Coriolaceae (Imazeki) Singer (Singer, 1961) was unavailable, and a new family name was required.

Trametaceae is clearly a validly published and legitimate name (International Code of Botanical Nomenclature, Art. 52.3). It cannot, however, be adopted for a family including the lectotype of *Coriolus* [*Polyporus versicolor* L. : Fr. according to Farr & al. (1979) but *P. lutescens* Pers. according to Greuter & al. (1993)], whether or not that genus is recognized or placed in synonymy with *Trametes*, since there is an older available name for such a family, Coriolaceae, the earliest legitimate name with the same rank (ICBN, Art. 11.3). The first author now recognizes that the correct family name for the group of genera and species he and his colleagues called Trametaceae is instead Coriolaceae, and he intends to use Coriolaceae henceforth for this concept. The family name will be used in a vastly restricted sense compared to that proposed in the current edition of the *Dictionary of the Fungi* (Hawksworth & al., 1995).

It should be emphasized that Trametaceae is only a *taxonomic* synonym of Coriolaceae. Should future authors decide that *Coriolus* and *Trametes* belong in separate families, the name Trametaceae could then become the correct name for a family excluding *Coriolus* but including *Trametes* and possibly other genera.

Similarly, since Trametaceae is a legitimate family name, the ordinal name Trametales, typified by that family name, is a validly published and legitimate ordinal name, and was not rendered illegitimate by Boidin & al.'s mistaken use of Trametaceae when they should have adopted Coriolaceae.

ACKNOWLEDGEMENTS

We thank Dr. Pavel Lizoň, Cornell University, for assistance with literature citations, and Dr. Dan H. Nicolson, Smithsonian Institution, for serving as a presubmission reviewer.

REFERENCES CITED

Boidin, J., J. Mugnier, and R. Canales. 1998. Taxonomie moléculaire des Aphyllophorales. *Mycotaxon* **66:** 445-491.

Farr, E. R., J. A. Leussink, and F. A. Stafleu [eds.]. 1979. Index nominum genericorum (plantarum). *Regnum Veget.* **100:** [i]-xxvi, 1-630.

Greuter, W. R. K. Brummitt, E. Farr, N. Kilian, P. M. Kirk, and P. C. Silva [eds.] 1993. NCU-3. Names in current use for extant plant genera. *Regnum Veg.* **129:** [i]-xxvii, 1-1464.

Hawksworth, D. L., P. M. Kirk, B. C. Sutton, and D. N. Pegler. 1995. *Ainsworth & Bisby's Dictionary of the Fungi,* ed. 8, xii+616 pp. CAB International, Wallingford.

Singer, R. 1961. Fungi of northern Brazil. *Publ. Inst. Micol. Recife* **304:** 3-26.

MYCOTAXON

Volume LXVIII, pp. 499-503 July-September 1998

TULOSTOMA PORTORICENSE (TULOSTOMATALES, GASTEROMYCETES) FROM MEXICO

M. ESQUEDA-VALLE [1], E. PÉREZ-SILVA [2], T. HERRERA [2],
A. ALTÉS[3] & G. MORENO [3]

[1] Departamento de Tecnología de Alimentos de Origen Vegetal, CIAD, A. C. Apartado postal 1735. Hermosillo. Sonora. 83000. Mexico.

[2] Laboratorio de Micología, Instituto de Biología, UNAM. Apartado postal 70-233, Coyoacán, Mexico, D. F. 04510.

[3] Departamento de Biología Vegetal, Universidad de Alcalá, E-28871 Alcalá de Henares, Madrid, Spain. E-mail: bvgmh@bioveg.alcala.es

Summary: The first record of *Tulostoma portoricense* J.E. Wright in North America (Mexico) and the second at world level is presented. The Mexican material is described macro- and microscopically, and is compared with the holotype. SEM photographs of the spore ornamentation are provided.

Key words: chorology, Gasteromycetes, taxonomy, *Tulostoma portoricense*.

INTRODUCTION

Sixty-three species of Gasteromycetes are known from Sonora (Mexico). Six genera of Tulostomataceae have been cited: *Battarrea, Battarreoides, Chlamydopus, Phellorinia, Schizostoma* and *Tulostoma*. The latter is represented by six species: *T. albicans* V.S. White, *T. fimbriatum* Fr. var. *campestre* (Morgan) G. Moreno, *T. nanum* (Pat.) J.E. Wright, *T. occidentale* Lloyd, *T. striatum* G. Cunn. and *T. xerophilum* Long (WRIGHT *et al.*, 1972; GUZMÁN, 1975; WRIGHT, 1987; ESQUEDA-VALLE *et al.*, 1996).

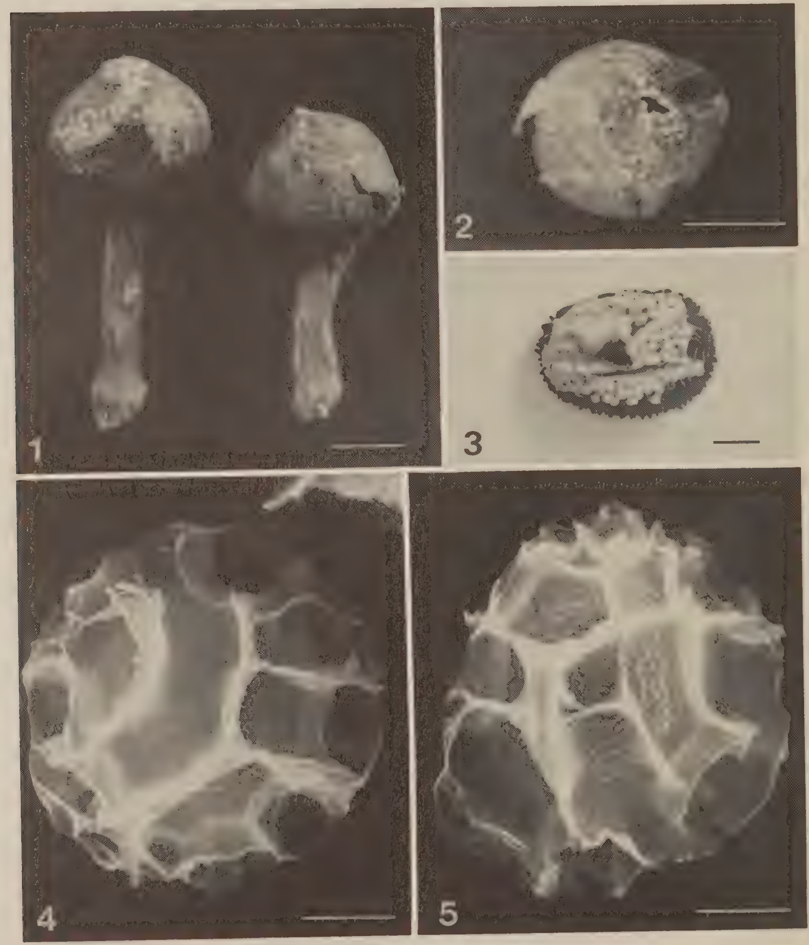
The two last taxa have been reported only from Sonora in the Mexican mycobiota. The second known record of *T. portoricense* J.E. Wright is added to this list in the present paper.

MATERIAL AND METHODS

The studied material is preserved in the Herbarium of the University of Alcalá, Madrid, Spain (AH), the macromycetes collection of the Centro de Estudios Superiores del Estado de Sonora, Unidad Hermosillo, Mexico

(CESUES), the Herbario Nacional del Instituto de Biología, UNAM, Mexico (MEXU), and the New York Botanical Garden, U.S.A. (NY).

The methods followed in this study are the same as those indicated in MORENO *et al.* (1995*b*).



Figs. 1-5 — Fig. 1: basidiocarps (*T. portoricense*, AH 24105). Fig. 2: detail of the fibrillose-fimbriate mouth (*T. portoricense*, AH 24105). Fig. 3: detail of the spore sac and the verrucose exoperidium (*T. exasperatum*, AH 13471). Figs. 4, 5: spores (*T. portoricense*, AH 24105).
Scale bars: Figs. 1-3 = 5 mm; Figs. 4, 5 = 2 µm.

DESCRIPTION

Tulostoma portoricense J.E. Wright, *The genus Tulostoma (Gasteromycetes). A world monograph*, p. 218, fig. 117, pl. XXVIII-5, 1987. (FIGS. 1-10)

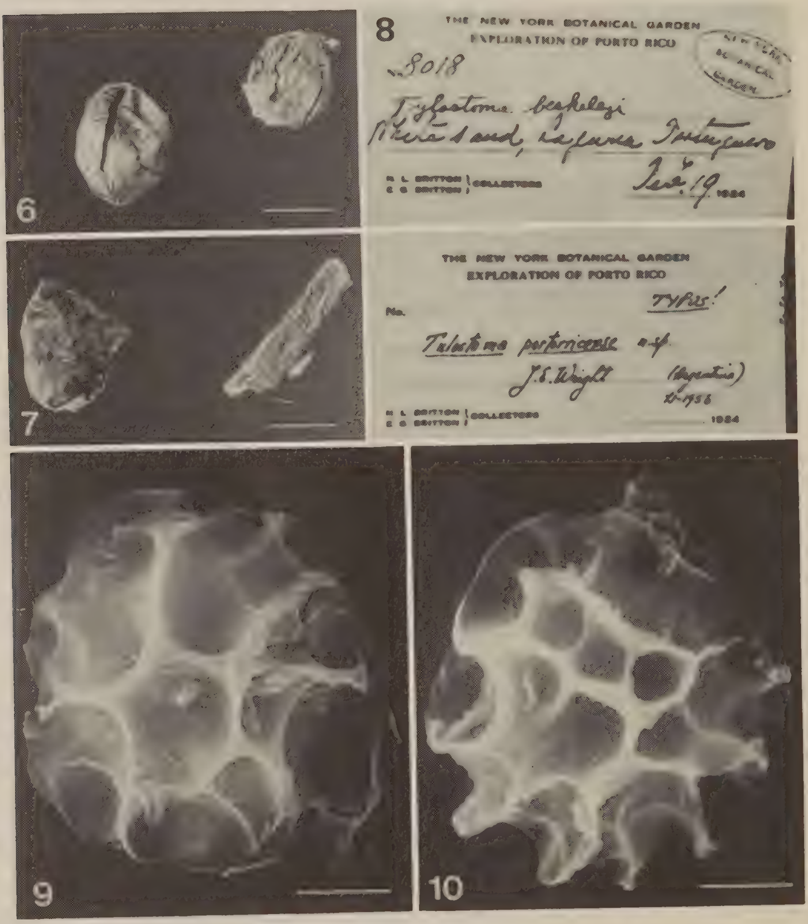
Studied material: PUERTO RICO, Laguna Tortuguera, white sand, *leg*. N.L. Britton & E.G. Britton, 19.II.1924, NY 8018, HOLOTYPE. MEXICO, Sonora, Bacoachi, km 164 Mazocahui-Cananea road, *leg*. M. Esqueda & J. Jiménez, 27.III.1993, under medium height bushes and trees in grassland, AH 24105 and CESUES 1251.

The Mexican material consists of four complete and non-fragmented basidiocarps. The characteristics of this collection are the following: Spore sacs 10-12 mm diam., subglobose (fig. 1). Exoperidium initially clearly consisting of the hyphal type, but soon presenting a hyphal-granulose aspect, brownish from the presence of soil and sand particles, persistent in the major part of the spore sac. Endoperidium whitish-cream, more or less smooth. Mouth fibrillose-fimbriate, slightly mammiform, without a delimited and colored peristome (fig. 2). Socket inconspicuous, covered and protected by a collar of well-developed brown scales. Stem 13-18 x 2-3 mm, covered by scales similar to those of the collar, slightly broadened at the base (4 mm diam.).

Spores 7-9 µm diam. including the ornamentation, ochraceous, with a prominent reticulum perfectly distinguished under LM, appearing under SEM to be formed by great wings projected up to 2 µm from the spore surface (figs. 4-5). Capillitium 3-7 µm diam., thick-walled, with a continuous lumen, pale yellow, branched, with some blunt and broadened ends, and also with some complete and uncolored septa variably broadened (up to 9 µm diam.). Exoperidium formed by a mixture of filaments, some of them similar to those of the capillitium, 2-4 µm diam., pale yellow, thick-walled, with a more or less continuous lumen, branched, but not broadened at the uncolored septa; other filaments are hyaline, thin-walled, and not broadened at the septa.

The type collection is formed by three squashed spore sacs (6.5-9 µm diam.) and the remains of very fragmented stems (approx. 2 mm diam.). This material is described in detail in WRIGHT (1987). Nevertheless it should be mentioned that the exoperidium has practically disappeared, only persisting as some brown and granulose (clearly not membranous) remains adhering to the spore sacs. The scales of the collar are well-preserved, identical to those of the Mexican material. The spores (figs. 9-10) are not different in size and ornamentation. Only the capillitium is somewhat thinner in the type material (2.5-5 µm diam.), and the septa are slightly ochraceous, but these are minor differences which we consider to fall within the range of variability of a single species.

Among the *Tulostoma* species with prominent reticulate spore ornamentation, *T. portoricense* is the only one which shows the following combination: fibrillose-fimbriate mouth and hyphal-granulose exoperidium. Hence its identification and separation from species such as *T. exasperatum* Mont. —with an exoperidium formed by conspicuous spines which leave dark circular scars on the endoperidium when falling off (fig. 3)— or *T. opacum* Long —with a clearly membranous exoperidium (MORENO *et al.*, 1995*a*; fig. 1)— is relatively easy. Considering that only the type collection of



THE NEW YORK BOTANICAL GARDEN
EXPLORATION OF PORTO RICO
No. 8018
Tylostoma berkeleyi
[illegible] sand, Laguna Tortuguero
N. L. BRITTON
E. G. BRITTON } COLLECTORS
Jan. 19. 1924

THE NEW YORK BOTANICAL GARDEN
EXPLORATION OF PORTO RICO
TYPUS!
No.
Tulostoma portoricense n.sp.
J.E. Wright (Argentina)
xi-1956
N. L. BRITTON
E. G. BRITTON } COLLECTORS
1924

Figs. 6-10 — *T. portoricense*, NY 8018, HOLOTYPE. Figs. 6, 7: basidiocarps. Fig. 8: label. Figs. 9, 10: spores.
Scale bars: Figs. 6, 7 = 5 mm; Figs. 9, 10 = 2 µm.

T. portoricense was previously known, this new record contributes to the clarification of the critical taxonomic status of this poorly known species from southern areas of North America.

ACKNOWLEDGMENTS

We are grateful to Prof. F.D. Calonge for the critical revision of the manuscript, to Mr. J.T. Palmer for cheking the English text, to the curator of the NY herbarium for the loan of the *T. portoricense* holotype, and to Mr. J.A. Pérez for his collaboration with the SEM.

LITERATURE CITED

ESQUEDA-VALLE, M., E. PÉREZ-SILVA, T. HERRERA & R.E. VILLEGAS (1996). Los Gasteromycetes citados de Sonora. *Vinculación* 1(2): 3-16.

GUZMÁN, G. (1975). Hongos mexicanos (macromicetos) en los herbarios del extranjero, III. *Bol. Soc. Méx. Micol.* 9: 85-102.

MORENO, G., A. ALTÉS & A. HAUSKNECHT (1995*a*). *Tulostoma opacum* Long in Northern Africa. *Mycotaxon* 54: 179-182.

MORENO, G., A. ALTÉS, C. OCHOA & J.E. WRIGHT (1995*b*). Contribution to the study of the *Tulostomataceae* in Baja California, Mexico, I. *Mycologia* 87: 96-120.

WRIGHT, J.E. (1987). *The genus Tulostoma (Gasteromycetes). A world monograph.* J.Cramer, Berlin-Stuttgart, Germany. 338 pp., 50 pl.

WRIGHT, J.E., T. HERRERA & G. GUZMÁN (1972). Estudios sobre el género *Tulostoma* en México (Fungi, Gasteromycetes). *Ciencia (Mexico)* 27(4-5): 109-122.

MYCOTAXON

Volume LXVIII, pp. 505-516 July-September 1998

PHENETIC ANALYSIS OF GENERA OF THE SAPROLEGNIACEAE (OOMYCETES)

MARTHA J. POWELL AND WILL H. BLACKWELL
Department of Biological Sciences, The University of Alabama
Tuscaloosa, AL 35487

ABSTRACT

Phenetic analyses of the 20 genera interpreted to belong to the family Saprolegniaceae (Saprolegniales, Oomycetes) were performed to improve understanding of generic morphology, similarities and dissimilarities, and character utility. A primary objective was to establish generic data of reliable comparability, in which each genus may be compared with every other genus for each character utilized. Using a data set of 24 stable characters visible with the light microscope, factored into character states, various similarity and distance matrices were generated. These proximity matrices were entered into clustering programs to derive corresponding phenograms. The phenogram presented depicts well the generic alignments based on overall morphological resemblance. Phenetic groupings and subgroupings evident in this phenogram are discussed, as well as their character bases. Also, differences between generic groupings of this phenogram and groupings in or inferred from more traditional literature are considered.

INTRODUCTION

The family Saprolegniaceae is in need of careful, comparative taxonomic scrutiny, especially in determining generic distinctions, similarities, and potential relationships. Existing treatments of the Saprolegniaceae, such as Fischer (1892), Humphrey (1893), Coker (1923), Coker and Matthews (1937), Wolf (1944), Sparrow (1960), and Dick (1973, 1990) will continue to be valuable and useful systematic resources. However, these works are primarily descriptive, revisionary, and/or "floristic," and are typically the result of an intuitive and monothetic systematic approach; often one or a few characters established groupings of genera, as in taxonomic keys. No formal method was provided for assessing groupings of taxa presented. Such groupings or orders of enumeration, based on a limited number of characters selected by taxonomic judgment, are inherently subjective arrangements. Nonetheless, orders of enumeration may follow the taxonomic keys (e.g., Coker and Matthews, 1937; Sparrow, 1960), which in turn may be followed by evolutionary-morphological assumptions, even if placed there by a subsequent readership. Since these classical taxonomic treatments selectively emphasized certain characters, as opposed to others, *de facto* weighting of characters is built into these treatments; and any groupings are a consequence of this subjective weighting. Examples of characters which received strong emphasis are spore discharge, planetism, and number of oospores per oogonium. A number of other characters have received scant attention, such as, sporangial differentiation and persistence; hyphal thickness, flexing (twisting), the shape of hyphal tips; and production of gemmae. Relatedly, a pervasive problem with existing literature on the Saprolegniaceae is the often incomplete comparability of morphological information from one genus to another, and occasionally the absence of information on certain characters and/or character states.

A change of methodology in studying the morphology of saprolegniacean taxa has been recommended. Dick (1973) stated that knowledge of the Saprolegniaceae would "only advance with a multivariate analytical approach." Jong et al. (1991) emphasized the need for a precise, consistent, extensive and quantitative approach to the description of the Saprolegniaceae. Jong and collaborators proposed a system of character examination which would lead to a uniform character coding methodology in descriptions of new saprolegnian "strains," i.e., species and varieties. Also seeking an objective foundation, a primary purpose of our study was to develop a structured data set which could serve as a basis for unbiased phenetic comparisons of genera of the Saprolegniaceae, and which could be used in numerical taxonomic analyses and procedures. This investigation, using polythetic, phenetic methodology, presents morphological similarities (overall resemblance) and dissimilarities (phenetic distance) among the genera, based on all characters employed in the analysis; no single character is requisite for group membership or order of enumeration. The character set in our study was generated from examination of those characters visible with the light microscope (or generally equivalent optics); our treatment is, in this sense, directly comparable to traditional systematic treatments of the family. It differs though in including all reliable characters possible, without bias toward a particular character subset. This numerical analysis of generic phenotype in the Saprolegniaceae should be viewed as a beginning intended to stimulate additional investigations of these organisms, at the ultrastructural and molecular levels, and in cladistic analysis. Additional characters may be added to our data set in the future, as further information becomes available.

METHODOLOGY

For the 20 genera we recognize as comprising the Saprolegniaceae, we developed a list of phenotypic characters from light microscopic observations and from literature investigation. The goal was to utilize as many characters of phenotype, providing generic separation, as possible. It has been suggested (see Stuessy, 1990) on numerical/statistical grounds, that at least 60 characters be utilized in a phenetic study; other suggestions indicated 100 or more (Sokal and Sneath, 1963). But, many studies (e.g., Ornduff and Crovello, 1968; Bretsky, 1971; Power, 1971) were unable to generate such large character lists. Usually, the less complex the organisms, the fewer are the unit morphological (phenotypically discrete) characters available for analysis (if ultrastructure is not considered). In dealing with relatively simple water molds, a large number of reliable characters could not be found. The phenotypic plasticity of the Saprolegniaceae (Salvin, 1942; Clausz, 1968; Seymour, 1970; Alabi, 1972; Padgett and Seymour, 1974; Langsam, 1986) also complicated the selection of suitable characters. After repeated study, attempted scoring, and elimination of non-contributing characters, 24 reasonably stable characters (predominantly nonsexual) were determined to vary with taxonomic significance and provide taxonomic distinction among the genera. Principal Components Analysis (in SAS) assisted in determining respective character contributions to generic taxonomy. The character variation was broken down into scorable states (0-1-2, etc.) for each character. Each OTU (genus) was scored by character state for each character (as it typically appears in that genus), and a 24 by 20 raw data matrix was constructed (Table 1). In keeping with original principles of phenetic analysis (see discussions of Sokal and Sneath, 1963; Stuessy, 1990), and lacking defensible evidence to the contrary, all 24 characters were utilized and were given equal weight in analyses performed.

The data matrix was entered into proximity programs using a variety of similarity (association) and dissimilarity (distance) coefficients. Gower's coefficient as well as the Rogers and Tamimoto coefficient, both able to handle multistate data, were useful as similarity measures. Manhatten Distance (City Block Metric) served as a corresponding dissimilarity algorithm (see Sokal and Sneath, 1963; Dunn and Everitt, 1982; Abbott et al., 1985; Rohlf, 1987; and Stuessy, 1990; for discussion of association and distance methodologies). Some authors (e.g., Minkoff, 1965) preferred distance measures to similarity measures (such as matching coefficients), especially if multistate data are involved. Manhatten Distance, a simple, unit-based distance metric, is useful in both phenetic and cladistic analysis (Stuessy, 1990).

Results from the various proximity matrices were entered into several clustering methodologies (see Jardine and Sibson, 1971 and Jain and Dubes, 1988 for review of clustering algorithms) to assess those giving optimal results. Clearest results were obtained by entering the dissimilarity matrix, obtained by Manhatten Distance, into a Farthest Neighbor (Complete Linkage) Cluster Analysis, using MVSP (Multivariate Statistical Package) clustering programs, version 2.1 (Kovach, 1993). Other clustering methodologies (e.g., nearest neighbor and group-average algorithms) were run for comparison, and provide similar though less graphically interpretable results. Because the data are qualitative (expressed as ordered integers) and not quantitative, group-average (average-linkage) clustering was not mandated. Single-linkage (nearest neighbor) clusters exhibited the "chaining" phenomenon for which the method has been criticized (Clifford and Stephenson, 1975). Complete linkage (farthest neighbor) methodology most clearly demonstrated the "cliques" or clusters of genera present, i.e., the partitioning of groupings. Consequently, results of the complete linkage analysis (based on Manhatten Distance) were selected for presentation (Fig. 1).

Use of complete linkage clustering on unitary data "transformed" by Manhatten Distance metric should give a phenogram useful in comparison of "dendrogram topology" (Phipps, 1971) not only with future phenograms, but also with cladograms (especially if these are derived by Manhatten Distance). A further reason for selecting Manhatten Distance measure in our study is that this (dissimilarity) metric distance produced phenograms generating a higher cophenetic correlation percentage (testing the matrices in NTSYS, using "COPH" and "MXCOMP;" Rohlf, 1987) than was obtained with a similarity measure such as the Rogers and Tanimoto association coefficient (considered "functionally related" to the Simple Matching Coefficient, see Sokal and Sneath, 1963). The phenogram resulting from use of Manhatten Distance was thus "truer" to the data matrix than phenograms generated by association coefficients. Our analyses thus support the general preference of Minkoff (1965) for distance (dissimilarity) measures.

GENERA INCLUDED IN ANALYSIS

The following 20 genera have traditionally been included in the Saprolegniaceae. Their order of enumeration (the first 17 following Sparrow's enumeration) and their abbreviations are the same as their order of entry into the data matrix. The authority is given for each, and the date (referencing to the Literature Cited) is provided for those (the last three listed) described since Sparrow's (1960) treatment. See Dick (1990) for a somewhat different interpretation of the Saprolegniaceae in which only 14 of the genera below (and 14 total) are still retained in the family.

TAXA	ABBREVIATIONS
1. PYTHIOPSIS de Bary.	(PYT)
2. SAPROLEGNIA Nees.	(SAP)
3. ISOACHLYA Kauffman.	(ISO)
4. LEPTOLEGNIA de Bary.	(LEP)
5. LEPTOLEGNIELLA Huneycutt.	(LEL)
6. PROTOACHLYA Coker.	(PRO)
7. ACHLYA Nees.	(ACH)
8. APHANOMYCES de Bary.	(APM)
9. SOMMERSTORFIA Arnaudow.	(SOM)
10. PLECTOSPIRA Drechsler.	(PLE)
11. APLANES de Bary.	(APL)
12. THRAUSTOTHECA Humphrey.	(THR)
13. CALYPTRALEGNIA Coker.	(CAL)
14. APHANODICTYON Huneycutt.	(APD)
15. DICTYUCHUS Leitgeb.	(DIC)
16. BREVILEGNIA Coker & Couch.	(BRE)
17. GEOLEGNIA Coker.	(GEO)
18. SCOLIOLEGNIA Dick, 1969.	(SCO)
19. BREVILEGNIELLA Dick, 1961.	(BRL)
20. COUCHIA Martin, 1981.	(COU)

CHARACTERS AND CHARACTER STATES

(Abbreviations and their order of listing are the same as in Table 1)

1. Zoospore Cyst Stages (CYS): 0=monocystic; 1=dicystic. If dicystic, organism is interpreted to have both a primary zoospore cyst and a secondary zoospore cyst.

2. Planetism (PLN): 0=nonmotile; 1=motile, primary zoospore functional only; 2=motile, secondary zoospore functional only; 3=motile, primary and secondary zoospores functional.

3. Primary Spore Destination (PSD): 0=remains in sporangium; 1=emerges, encysting near sporangial opening; 2=emerges, some encysting near sporangial opening, some swimming away; 3=emerging and swimming away, encysting at a distance from sporangium.

4. Sporangial Dehiscence (or deliquescence) Pattern (SDP): 0=absent; 1=basal and/or lateral; 2=apical; 3=by evacuation (exit) tube

5. Spore Rows per Sporangium (SPR): 0=one; 1=one to several; 2=more than one.

6. Sporangial Internal Network (SGN): 0=absent; 1=sometimes (or temporarily) present; 2=present and persistent.

7. Sporangial Proliferation (SPL): 0=absent; 1=absent or internal; 2=internal; 3=internal or cymose/sympodial; 4=cymose/sympodial.

8. Sporangial Persistence (SGP): 0=remains attached; 1=deciduous.

9. Primary Zoospore Cyst Wall Thickness (CWT): 0=thin; 1=thick.

10. Sporangial Operculum (OPR): 0=absent; 1=present.

11. Persistence of Sporangial Wall (PSW): 0=not persistent; 1=persistent or not; 2=persistent.

12. Primary Zoospore Cyst Germination (PCG): 0=within sporangium; 1=external or within; 2=external to sporangium.

13. Sporangial Constrictions Between Spores (CON): 0=absent; 1=present.

14. Appressorial Complex (APC): 0=absent; 1=present.

15. Sporangial Shape (SGS): 0=globose or broadly ovate/obovate; 1=clavate or narrowly ovate/obovate; 2=cylindrical or narrowly lanceolate/oblanceolate; 3=convoluted or irregular.

16. Hyphal Tips distinctly Pointed or Taper-Pointed (HTP): 0=no; 1=yes.

17. Hyphal Twisting (HTW): 0=hyphae more or less straight; 1=hyphae twisted, bent or flexuous.

18. Sporangium versus (distinction from) Hypha (SVH): 0=undifferentiated; 1=differentiated, by width and/or shape; 2=differentiated, by folding.

19. Sporangial Papillation (PAP): 0=no papilla present; 1=one papilla developing; 2=multiple papillae developing.

20. Gemmae (GEM): 0=absent; 1=present. Present means that organism is known to form gemmae, not that gemmae are always seen.

21. Sporangial Branching (SGB): 0=usually unbranched; 1=often branched.

22. Hyphal Thickness (HTH): 0=slender (thin diameter); 1=slender or stout; 2=stout.

23. Mycelial Development (MYD): 0=reduced; 1=well developed.

24. Number of Oospores or (oospheres) i.e., "eggs," per Oogonium (OOS): 0=none (oospores and oogonium unknown); 1=one; 2=one to several; 3=more than one.

RESULTS

The results of this analysis (Table 1, Fig. 1) are a consequence of phenetic numerical taxonomic procedures (Sokal and Sneath, 1963; Sneath & Sokal, 1973; Dunn & Everitt, 1982), not of cladistic protocols. The enumeration and groupings of genera in the phenogram (Fig. 1) are representative of overall similarity/dissimilarity, based simultaneously and uniformly on all 24 characters in the data matrix (Table 1); all characters are those of phenotype as perceived at the light microscopic level. Relationships are inferred only in a phenetic sense, based on overall resemblance, and do not necessarily carry phylogenetic meaning (cf. Stuessy, 1990). Our analysis of genera of the Saprolegniaceae, as in most phenetic clustering analyses, is polythetic. It provides an alternative to traditional morphological and evolutionary-morphological treatments of the family, which are fundamentally monothetic. The data base and the phenetic groupings and enumeration of genera in the phenogram should establish an objective foundation for comparing the presentations of other studies.

TABLE 1: CHARACTER STATES OF CHARACTERS FOR GENERA OF THE SAPROLEGNIACEAE *

CHARACTERS	GENERA																			
	PYT	SAP	ISO	LEP	LEL	PRO	ACH	APM	SOM	PLE	APL	THR	CAL	APD	DIC	BRE	GEO	SCO	BRL	COU
CYS	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	1
PLN	1	3	3	3	3	3	2	2	2	2	0	2	2	2	2	2	0	3	0	3
PSD	3	3	3	3	3	2	1	1	1	1	0	0	0	0	0	0	0	3	0	1
SDP	2	2	2	2	3	2	2	2	3	3	0	1	2	0	0	1	0	2	2	2
SPR	2	2	2	0	0	2	2	0	0	1	2	2	2	2	2	1	0	2	1	2
SGN	0	0	0	0	0	1	0	0	0	0	1	0	0	2	2	0	0	0	0	0
SPL	4	2	3	1	0	3	4	0	0	0	3	0	0	0	0	0	0	2	0	2
SGP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
CWT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
OPR	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
PSW	2	2	2	2	2	2	2	2	2	2	2	0	2	2	1	0	2	2	1	2
PCG	2	2	2	2	2	1	2	2	2	2	0	2	2	0	0	2	2	2	2	2
CON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
APC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SGS	0	2	1	2	3	2	2	2	3	3	2	1	2	0	2	2	2	2	2	0
HTP	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
HTW	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SVH	1	1	1	0	0	1	1	0	2	2	1	1	1	1	1	0	1	1	0	1
PAP	1	1	1	0	0	1	1	0	0	0	0	0	0	2	0	0	0	1	0	1
GEM	1	1	1	0	0	1	1	0	0	0	1	1	0	0	0	1	0	1	0	0
SGB	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
HTH	0	2	1	0	0	1	2	0	0	0	2	2	2	0	2	2	0	1	0	1
MYD	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	0	0	1	0	1
OOS	2	3	2	1	0	3	3	1	1	1	3	3	2	2	1	1	1	2	0	2

Table 1 (Data Table). 20 genera of Saprolegniaceae scored for 24 characters. *Abbreviations for genera in the "Genera Included in Analysis" section; abbreviations for characters in the "Characters and Character States" section.

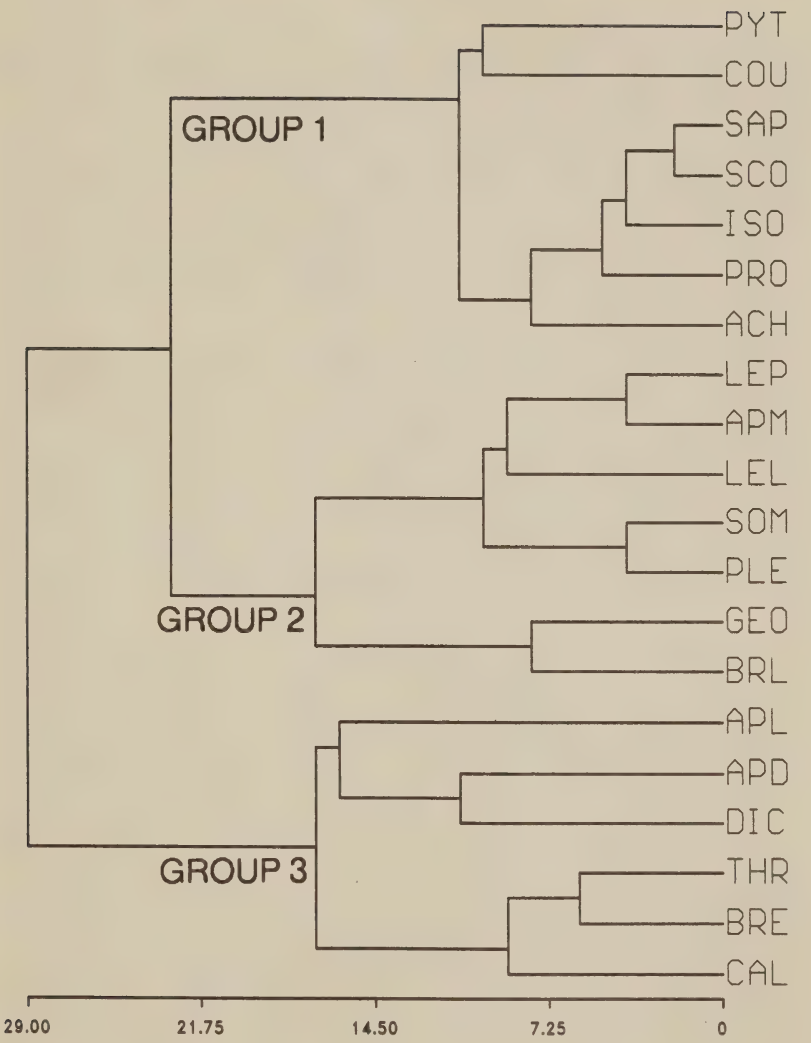


Figure 1 (Phenogram). Phenetic distance of 20 genera of Saprolegniaceae based on data provided in Table 1. The Manhatten metric was used as the distance measure, and Farthest Neighbor was employed as the clustering algorithm. Scale bar across bottom indicates percent dissimilarity. Abbreviations for genera are found in the "Genera Included in Analysis" section.

DISCUSSION

This analysis reveals several important insights into the phenetic relationships among the Saprolegniaceae. Three general phenetic groupings of genera are evident (Fig. 1), at a roughly similar level of phenetic similarity/dissimilarity: (Group 1) the *Pythiopsis* to *Achlya* grouping, in which primary zoospores escape from the sporangium, either encysting immediately (near the sporangial orifice) or swimming away to encyst later (at a distance); (Group 2) the *Leptolegnia* to *Brevilegniella* grouping, with variable spore release and motility, but often with only a single (uniseriate) row of spores in the sporangium; (Group 3) the *Aplanes* to *Calyptralegnia* grouping, in which if spores escape from the sporangium, it is either the primary zoospore cyst or the secondary zoospore germinated from this cyst which escapes or is liberated, and not the primary zoospore per se; in other words, the primary zoospore stage is suppressed.

The most significant difference between our phenetic results and earlier enumerations is that those genera with only a single row of spores per sporangium (Group 2) cluster in the phenogram (Fig. 1), and are not separated (in part), as for example in Sparrow's (1960) treatment. We note the exception that *Brevilegniella*, in which spores are usually uniseriate, may be bi- or tri-seriate distally in the sporangium (Dick, 1961). Also, *Plectospira* has a single spore row in its exit tube, but may be other than uniseriate in the lobed sporangium. But again, all of these phenetic groupings (1, 2 & 3) are polythetic, based on all characters simultaneously, with a number of characters playing a role in each grouping. So, group membership (as in Group 2) should not be inferred from the presence or absence of one character, such as SPR. It is interesting that, with the partial exception of the clustering of Group 2, Sparrow's (1960) order of enumeration (and keyed groupings) bears a general correspondence to our phenetic groupings/enumeration.

In Group 1, recognition of *Couchia*, described from midge eggs by Martin (1981), is supported by our phenetic results, occupying a distinct position between *Pythiopsis* and the *Saprolegnia* subcluster group. This phenetic support for *Couchia* is in contrast to a previous view that *Couchia* and *Isoachlya* are not separable on morphological grounds (Dick, 1990). Although Seymour (1970) united *Isoachlya* with *Saprolegnia*, our phenetic results suggest maintenance of *Isoachlya* as a distinct genus; similarly, *Protoachlya* is phenetically distinct. Dick's (1969) genus *Scoliolegnia*, a proposed generic segregate of *Saprolegnia*, is less strongly substantiated, being delimited (in our analysis) only by intergrading characters of hyphal diameter and numbers of oospores per oogonium. We recognize, however, that consideration of additional oogonial/oospore characters, not included in our analysis because of either variability or incomplete information, might lend support to recognition of *Scoliolegnia*. The putative genus *Cladolegnia* Johannes (1955) was placed in synonymy of *Isoachlya* by Sparrow (1960). Dick (1969) indicated that *Cladolegnia* has species assignable to either *Saprolegnia* or *Isoachlya*. In agreement with Sparrow and Dick, we are not recognizing *Cladolegnia* as a distinct genus of Saprolegniaceae, and it is not included in our analysis. *Achlya*, in which all primary zoospores encyst as a ball-like cluster just outside the sporangial opening (Johnson, 1956), appears distinct within the *Saprolegnia* subcluster (Fig. 1). However, in terms of primary zoospore behavior, it is reasonable to envision *Protoachlya* as transitional between *Achlya* and *Saprolegnia*. Cladistic analysis would provide a better assessment, though, of any such potential relationship.

Considering Group 2, one might suppose from the names that *Brevilegniella* and *Brevilegnia* (Group 3) are morphologically similar. However, the phenetic placement of *Brevilegniella* (Dick, 1961) is with Group 2. *Brevilegniella* and *Geolegnia*, phenetically "related" by their apparent nonmotility, form a distinct subgrouping of Group 2. Dick's

(1971) proposed segregate (from the Saprolegniaceae), the putative family Leptolegniellaceae (which, among genera in our study, would include *Brevilegniella*, *Leptolegniella*, and *Aphanodictyon*), is not supported by our results; these genera do not form a close phenotypic grouping, but are distributed within different groupings or subgroupings. *Leptolegniella* is phenetically closest to *Leptolegnia* and *Aphanomyces* (and not to other supposed members of the Leptolegniellaceae); *Aphanodictyon* is in Group 3. We did not include all alleged leptolegniellaceous taxa in our analysis. *Aphanomycopsis* Scherffel (1925), for example, has been traditionally placed with the holocarpic Ectrogellaceae (Sparrow, 1960), and it would thus not logically have been included in our accounting of saprolegniacean (or leptolegniellacean) taxa. Dick (1990) indicated that *Sommerstorfia* might be transferred to the Leptolegniellaceae, when more information on the sexual stage became available. Our results (Fig. 1) show *Sommerstorfia* to be phenetically close to *Plectospira*; both are somewhat similar obligate parasites. If relationships of *Sommerstorfia* and *Plectospira* are sought, a morphologically suitable candidate might be the often parasitic *Aphanomyces*, in which primary zoospores also typically encyst immediately external to the sporangial opening (Scott, 1961). The rotifer parasite *Hydatinophagus* Valkanov (1931), recognized as a distinct genus by Wolf (1944), is a species of *Aphanomyces* (Scott, 1961). More puzzling than the presumptive membership of the "Leptolegniellaceae" is Dick's (1990) removal of this "family" from the Saprolegniales, and placement in the Pythiales. In our phenogram, the genera of the proposed Leptolegniellaceae appear well placed, distributed among other saprolegniacean taxa. The generally uniseriate sporangia (or exit tubes) of members of Group 2 may be related to an indistinctness between sporangium and hyphae, and this in turn to a generally narrow hyphal diameter. Also, the usual finding of no more than one oospore per oogonium (i.e., because the oogonium is small), is likewise possibly connected to narrow hyphal diameter. Even sporangial dehiscence may be related to hyphal diameter since an apical dehiscence would seem to be the primary method feasible with a narrow yet persistent sporangium. Possible codependence of certain features may be elucidated by further analyses.

In Group 3, *Brevilegnia* (unlike *Brevilegniella*) clusters with *Thraustotheca*, a morphological similarity suggested by Salvin (1942). Both *Brevilegnia* and *Thraustotheca* exhibit rapid deliquescence of the sporangial wall. Since *Brevilegnia* and *Calyptralegnia* (the only genus with an operculum) were taxonomically derived as generic segregates of *Thraustotheca* (see Coker, 1927; Blackwell and Powell, 1993), the presence of these three genera in a subgrouping is not surprising. Also expected is the placement of *Dictyuchus* in general phenon Group 3, given its suppressed primary zoospore stage. The primary zoospore cyst walls of *Dictyuchus* remain attached after secondary zoospore release, resulting in a characteristic network appearance in the sporangium. The "true-net" and "false-net" sporangia (and species) of *Dictyuchus* (Couch, 1931) are not distinguished herein because of general phenetic similarity, and the discovery of intermediate forms (Padgett and Seymour, 1974); but this matter deserves further consideration. *Aphanodictyon*, also with a sporangial cyst network, has a phenetic connection to *Dictyuchus*, this being consistent with statements by Huneycutt (1948) and with Sparrow's (1960) order of enumeration. *Aplanes* remains a poorly understood genus, since it is usually seen in sexual stage (Coker, 1923; Sparrow, 1960), and a zoosporangial stage is often lacking.

Considering character significance, Salvin (1942) indicated that asexual characters (e.g., nature of the sporangium, spore release, spore behavior) are of major importance in distinguishing saprolegniacean genera. We agree, but would broaden this category to nonsexual characters. Of the 24 characters in our study, 23 are nonsexual. Several sexual characters initially considered in our study, such as the centricity or eccentricity of the large lipid globule in the oosphere, were eliminated because of either a difficulty in determining and scoring character states or a numerically insignificant contribution to generic separation (revealed by principal components and other types of analysis).

Regarding the included sexual character, OOS, Clausz (1968) noted that the number of oospores per oogonium could vary with environmental conditions such as temperature. However, Soumati and Dick (1988) considered oospore number (in the context of oogonial volume) to be a more stable feature. Highlighted as a generic character in Sparrow (1960), it is interesting that, in the case of *Brevilegnia* and *Thraustotheca*, for example, the number of oospores or oospheres ("eggs") per oogonium is not necessarily a requirement for placement of a genus in a particular phenetic grouping, and may not play as large a role in generic delimitation as previously suspected. The phenetically distinct genus *Couchia*, for example, has one to several oospores per oogonium. Since two genera in our analysis, *Leptolegniella* and *Brevilegniella*, could not be definitively determined to possess oospores, or for that matter oogonia, the scoring of additional sexual characters was impeded. Sexual traits, in addition to number of oospores per oogonium, which might be examined in future phenetic or cladistic studies are: oogonial biometry (Soumati and Dick, 1988), antheridial and oogonial relationships, oospore and oogonial wall ornamentation, and perhaps oospore centricity. However, these additional sexual traits were found in our investigation to be difficult to score and/or intragenerically variable, and may be more useful at the taxonomic level of species rather than genus. This opinion is consistent with several other statements concerning the utility of sexual characters in saprolegniacean taxonomy (e.g., Johnson, 1956; Seymour, 1970). Future investigations and analyses will hopefully clarify which additional characters, sexual and/or nonsexual, may be added to our present data base.

CONCLUSIONS

1. Though having received several excellent traditional morphological-evolutionary systematic treatments, the family Saprolegniaceae has for some time been in need of a more objective method of taxonomic analysis. This study provides a phenetic analysis of genera of the family, utilizing characters visible with the light microscope.

2. The phenetic methodology and analysis applied in this study are useful in several ways. First, a data base is generated in which all genera of Saprolegniaceae may be compared on all characters in the analysis. Second, this data base and the phenogram derived from it are useful in comparison to more traditional treatments of the family, such as that of Sparrow (1960) and others listed in the Introduction. Our analysis of phenotype should also provide a foundation for future ultrastructural, molecular, and cladistic studies. Additional characters will eventually be added to our data base.

3. The phenon groupings of saprolegniacean genera in this paper correspond generally to traditional systematic treatments, with one major exception. The genera with usually only one spore row per sporangium (Group 2) are seen to cluster; and are not as phenotypically separable as is implicit in some former studies (e.g., Sparrow, 1960). However, Group 2, as other groupings in the phenogram, must be understood as a polythetic, not monothetic, consequence. The basis of all groupings in this study is phenetic, and not necessarily phylogenetic.

4. A number of assumptions may be tested by an analysis such as ours, including the recognition (based on phenetic distinctness) of proposed segregate genera, such as *Scoliolegnia*, or even proposed segregate families of the Saprolegniaceae, such as the Leptolegniellaceae.

5. Nonsexual characters dominantly provide intergeneric taxonomic separation and delineation of members of the Saprolegniaceae. Of 24 characters utilized in our analyses, 23 are nonsexual. Sexual (oogonial and antheridial) characters are generally more variable, and perhaps of greater utility when intragenerically applied.

ACKNOWLEDGEMENTS

We thank Dr. John C. Clausz, Carroll College, Waukesha, Wisconsin; Dr. Nicholas P. Money, Miami University, Ohio; and Dr. W. Wallace Martin, Randolph-Macon College, Virginia, for their constructive reviews of this manuscript. We also thank Dr. David E. Padgett, University of North Carolina at Wilmington and Dr. Terry W. Hill, Rhodes College, Tennessee, for helpful comments prior to formal review. This work was supported by National Science Foundation grants #BSR 91-07451 and #DEB 94-96228.

LITERATURE CITED

ABBOTT, L.A., F.A. BISBY, and D.J. Rogers. 1985. Taxonomic Analysis in Biology. Columbia Univ. Press, New York.

ALABI, R.O. 1972. Thraustothecoid sporangium formation in three Saprolegniaceae from Nigeria. Trans. Brit. Mycol. Soc. 58: 519-521.

BLACKWELL, W.H. and M.J. POWELL. 1993. Taxonomic history of the Oomycete genus *Thraustotheca*. Mycotaxon 47: 183-192.

BRETSKY, S.S. 1971. Evaluation of the efficacy of numerical taxonomic methods: an example from the bivalve mollusks. Syst. Zool. 20: 204-222.

CLAUSZ, J.C. 1968. Factors affecting oogenesis and oospore germination in *Achlya hypogyna*. J. Elisha Mitchell Sci. Soc. 84: 199-206.

CLIFFORD, H.T. AND W. STEPHENSON. 1975. An Introduction to Numerical Classification. Academic Press, New York.

COKER, W.C. 1923. The Saprolegniaceae, with Notes on Other Water Molds. Univ. North Carolina Press, Chapel Hill.

COKER, W.C. 1927. Other water molds from soil. J. Elisha Mitchell Sci. Soc. 42: 207-226.

COKER, W.C. and V.D. MATTHEWS. 1937. Family 1. Saprolegniaceae. North American Flora 2(1): 17-58.

COUCH, J.N. 1931. Observations on some species of water molds connecting *Achlya* and *Dictyuchus*. J. Elisha Mitchell Sci. Soc. 46: 225-229.

DICK, M.W. 1961. *Brevilegniella keratinophila* gen. nov., sp. nov. Michigan Acad. Sci. 46: 195-204.

DICK, M.W. 1969. The *Scoliogenia asterophora* aggregate, formerly *Saprolegnia asterophora* de Bary (Oomycetes). Bot. J. Linn. Soc. 62: 255-266.

DICK, M.W. 1971. Leptolegniellaceae fam. nov. Trans. Brit. Mycol. Soc. 57: 417-425.

DICK, M.W. 1973. Saprolegniales. pp. 113-144 In: G.C. Ainsworth et al. (Eds.). The Fungi, An Advanced Treatise, Vol. IVB. Academic Press, New York.

DICK, M.W. 1990. Phylum Oomycota. pp. 661-685 In: L. Margulis et al. (Eds.). Handbook of Protoctista. Jones & Bartlett, Boston.

DUNN, G. and B.S. EVERITT. 1982. An Introduction to Mathematical Taxonomy. Cambridge Univ. Press.

FISCHER, A. 1892. Saprolegninae. pp. 310-383 In: Rabenhorst's Kryptogamenflora 1(4).

HUMPHREY, J.E. 1893. The Saprolegniaceae of the United States, with notes on other species. Trans. Amer. Phil. Soc. (N.S.) 17: 63-148.

HUNEYCUTT, M.B. 1948. Keratinophilic Phycomycetes I. A new genus of the Saprolegniaceae. J. Elisha Mitchell Sci. Soc. 64: 277-285.

JAIN, A.K. and R.C. DUBES. 1988. Algorithms for Clustering Data. Prentice Hall, Englewood Cliffs, New Jersey.

JARDINE, N. and R. SIBSON. 1971. Mathematical Taxonomy. John Wiley & Sons, London.

JOHANNES, H. 1955. Die gattung *Cladolegnia* Joh. gen. nov. (Isoachlya Kauffman) der Saprolegniaceae Nees. Feddes Rep. 58: 209-220.

JOHNSON, T.W. 1956. The genus *Achlya*: Morphology and taxonomy. Univ. Michigan Press, Ann Arbor.

JONG, S.C., E.E. DAVIS, C. MCMANUS, and M.I. KRICHEVSKY. 1991. Computer coding of strain features of the saprolegnian fungi. Mycotaxon 41: 407-418.

KOVACH, W.I. 1993. MVSP - A Multivariate Statistical Package for IMB-PC's., ver. 2.1. Kovach Computing Services, Pentraeth, Wales, U.K.

LANGSAM, D.M. 1986. *Achlya bispora*: a taxonomic reassessment of *Brevilegnia bispora*. Mycologia 78: 600-604.

MARTIN, W.W. 1981. *Couchia circumplexa*, a water mold parasitic in midge eggs. Mycologia 73: 1143-1157.

MINKOFF, E.C. 1965. The effects on classification of slight alterations in numerical technique. Syst. Zool. 14: 196-213.

ORNDUFF, R. and T.J. CROVELLO. 1968. Numerical taxonomy of Limnanthaceae. Amer. J. Bot. 55(2): 173-182.

PADGETT, D.E. and R.L. SEYMOUR. 1974. Variability of zoospore discharge in species of the genus *Dictyuchus*. Mycologia 66: 615-627.

PHIPPS, J.B. 1971. Dendrogram topology. Syst. Zool. 20: 306-308.

POWER, D.M. 1971. Statistical analysis of character correlations in Brewer's blackbirds. Syst. Zool. 20: 186-203.

ROHLF, F.J. 1987. NTSYS-pc: Numerical Taxonomy System for the IBM PC microcomputer (and compatibles), ver. 1.20. 28 pp. Applied Biostatistics, Inc., Setauket, NY.

SALVIN, S.B. 1942. Variations of specific and varietal character induced in an isolate of *Brevilegnia*. Mycologia 34: 38-51.

SCHERFFEL, A. 1925. Endophytische Phycomyceten-parasiten der Bacillariaceen und einige neue monadinen. Ein beitrag zur phylogenie der Oomyceten (Schroter). Arch. Protistenk. 52: 1-141.

SCOTT, W.W. 1961. A monograph of the genus *Aphanomyces*. Virginia Agri. Exp. Sta. Tech. Bull. 151: 1-95.

SEYMOUR, R.L. 1970. The genus *Saprolegnia*. Nova Hedwigia 19: iv-124.

SNEATH, P.H.A. and R.R. SOKAL. 1973. Numerical Taxonomy: The Principles and Practice of Numerical Classification. W.H. Freeman, San Francisco.

SOKAL, R.R. and P.H.A. SNEATH. 1963. Principles of Numerical Taxonomy. W.H. Freeman, San Francisco.

SOUMATI, B. and M.W. DICK. 1988. Biometry of oogonia and oospores of Saprolegniaceae. Bot. J. Linn. Soc. 100: 219-235.

SPARROW, F.K., Jr. 1960. Aquatic Phycomycetes, 2nd. rev. ed. Univ.Michigan Press, Ann Arbor.

STUESSY, T.F. 1990. Plant Taxonomy: The Systematic Evaluation of Comparative Data. Columbia Univ. Press, New York.

VALKANOV, A. 1931. Uber die morphologie und systematik der rotatorienbefallenden Oomyceten. Jahrb. Unv. Sofia 27: 215-233.

WOLF, F.T. 1944. The Aquatic Oomycetes of Wisconsin. Part 1. Univ. Wisconsin Press, Madison.

MYCOTAXON

Volume LXVIII, pp. 517-520 July-September 1998

BOOK REVIEWS

Eric H.C. McKenzie, Book Review Editor

Flora Mycologica Iberica, Vol. 2: Myxomycetes, I. Ceratiomyxales, Echinosteliales, Liceales, Trichiales by Carlos Lado and Francisco Pando (1997). 323 pp., 95 figures, 275 x 195 mm. Real Jardín Botánico, CSIC, 28014 Madrid, Spain. Distributed for all countries except Spain by J. Cramer, Gebrüder Borntraeger, D-14129 Berlin, D-70176 Stuttgart, Germany. ISBN 3-443-65007-4. DM 120.

This book is the culmination of studies of Iberian myxomycetes carried out over the past two decades. The authors indicate that the main objective of the book is to assist in the identification of those species of myxomycetes known to occur in the Iberian Peninsula (continental Spain and Portugal, Andorra) and the Balearic Islands. Four of the six orders generally recognized for the myxomycetes are treated; the two remaining orders, Physarales and Stemonitales, will be treated in a forthcoming volume. Within the four orders under consideration, 117 species have been reported from or are likely to occur in the region, but only those 105 species for which authentic material was available for examination by the authors are treated in detail. The overall systematic scheme followed is that used in *The Myxomycetes* by Martin & Alexopoulos (1969), with a few modifications (e.g., *Cribraria cancellata* instead of *Dictydium cancellatum*, *Metatrichia floriformis* instead of *Trichia floriformis*, and *Hemitrichia minor* instead of *Perichaena minor*) that have been proposed since publication of the earlier monograph.

The main body of the book considers each accepted species in turn, with a full description, information on habitat and distribution, and a section entitled "Observations" that provides additional information relating to such things as taxonomic features, relationships with other taxa, and nomenclature. An original figure is provided for each species. Several artists contributed figures to the work, and minor differences in style are apparent. However, on the whole the figures provided are very good to excellent. All of the figures are line drawings, and for most species these are a full page in size. This is a refreshing departure from the small size of the figures used in some previous works on the myxomycetes.

The authors have chosen to use the general term "sporophore" for the fruiting structure produced by myxomycetes and "sporocarp" for those sporophores with a well-developed morphological pattern. They go on to propose the term "sporotheca" for the spore-containing portion of a myxomycete sporophore. The authors suggest (and this reviewer would agree) that the consistent use of these terms removes the ambiguities sometimes associated with the term "sporangium," which in other taxonomic works dealing with the myxomycetes has been applied to the entire fruiting structure in some instances and to just the portion containing the spore mass in others.

The single most noteworthy aspect of the book relates to the fact that all of the text is presented in both English and Spanish versions. Each page is printed in a two column format, with the Spanish version on the left and the English version on the right. This truly innovative approach allows the potential audience for the book to be considerably larger than would be the case for a book published in just a single language.

Anyone with a serious interest in the myxomycetes should obtain this book, which is a worthwhile addition to the body of taxonomic literature available for the myxomycetes. This reviewer looks forward to seeing the second volume on the Physarales and Stemonitales.

Steven L. Stephenson, Department of Biology, Fairmont State College, Fairmont, WV 26554-2470, U.S.A.

Larger Fungi of South Australia by C.A. Grgurinovic (1997). vi + 725 pp., 449 line-drawings, 34 plates (30 in colour), 245 x 170 mm. The Botanic Gardens of Adelaide and State Herbarium, and The Flora and Fauna of South Australia Handbooks Committee. Orders: State Herbarium of South Australia, North Terrace, Adelaide, South Australia 5000 (e-mail: teadsforth@btg.denr.sa.gov.au). Softcover ISBN 0 7308 0737 1. A$95 plus A$25 postage and packing overseas or A$10 in Australia.

This book is a highly informative and wonderfully produced publication on the South Australian macromycota, and is very reminiscent of David Pegler's accounts in the *Kew Bulletin Additional Series* on the agarics of Sri Lanka, East Africa, and the Lesser Antilles. The present book can really be thought of as a revision of the major part of Cleland's two volumes entitled *Toadstools and Mushrooms and other Larger Fungi of South Australia* (1934-35), incorporating new ideas on nomenclature and taxonomy.

After a few preliminary words the 'Introduction' (8 pages) is composed largely of an account on John Burton Cleland, an incredibly prodigious collector; in fact, it is because Cleland had documented and preserved his material so well that it was possible for Grgurinovic to re-examine the data and condense it all in a clear and friendly way. There is a very short 'Methods and Materials' section.

The main text concentrates on the description of species found in South Australia, in part also applicable to other areas of Australia. The descriptions are supported by line-drawings and full synonymy, although the reviewer had a little difficulty with the unconventional way some of the author citations were telescoped after the binomial, but this is rather a minor criticism. In total, 430 species are dealt with dispersed in 19 orders, 55 families, and 122 genera. Of these, 96 species and varieties are new, there are 43 new combinations, 7 new names, and 6 new states proposed. All collectors are cited unless it was Cleland. There are keys to orders, families, genera, and species which on the face of it look very workable.

After each generic account doubtful records, poorly known species, or those that might be expected to occur in South Australia are listed.

In a single block amongst the descriptions are found 4 black and white plates from Cleland and 30 coloured plates, of which 28 are reproductions of paintings, the rest being photographs mostly by K. Thomas. For those unfamiliar with basidiomycete terminology 13 pages of glossary are included. There is a useful table listing the Ridgeway colours used by Cleland together with their Munsell and Methuen equivalents.

The largest genera dealt with by far are *Mycena* and *Cortinarius*, both with 30 species in comparison to over 100 and approaching 350, respectively, known from the U.K. In contrast, the genus *Amanita* supports 20 species in both the U.K. and in South Australia. Indeed, the total number of species for the British Isles is four times that of South Australia, but Britain has been fortunate in having been worked over by many generations of mycologists. It is interesting to see that *Suillus*, comprising only introduced species, sports the same number as *Boletus*; this contrasts with the situation in Europe. Surprisingly *Russula* is also very poorly represented, compared with Europe, as only 13 taxa are considered. A few taxa are not formally named but it is rather revealing that the author finds the most common South Australian *Pisolithus* nameless; it is also refreshing to see that the Pisolithaceae is given its rightful place.

The classification adopted is an odd mixture of Singer's works and Jülich's system which may throw some readers at first, but perhaps not as much as the choice of fungi included. Although the book is entitled *Larger Fungi* and the gasteroid fungi are included, the bracket fungi and relatives are not, except the pleurotoid forms, even though South Australia is home to the well-known "'Blackfellow's Bread', *Polyporus myllitae*. The choice was really governed by Cleland's collections and not any classificatory straight-jacket. The reviewer was rather amazed to find that relatively few phalloids were recorded from the area under consideration as it is a group one usually identifies with Australia and the Southern Hemisphere. Nevertheless, *Tulostoma* with 25 species makes up for this paucity! Some old North American and European friends such as *Lepista nuda*, thought to be introduced, and *Flammulina velutipes* are also included.

The book was put together by the author almost single-handedly and has been a real labour of love. Thank heavens the trials and tribulations experienced during its production were overcome so that the mycological audience could all share in this pain-staking work. In *Laccaria*, Grgurinovic has been helped by Tom May, where four unamed species are included (note sp. B-E, A is missing) and in the coprinoid agarics by Tony Young. Undoubtedly the author will consider her book to be only the first attempt of a much overdue account of South Australian fungi. Certainly there is no doubt it has the potential to spur people on and add to it in the future. In addition it gives to those on the other side of the world an insight into the fungi of a subcontinent until recently rather neglected. It is the first major revision of taxa of Australian macrofungi for 60 years and may it herald many such volumes. It was desperately needed, not only to document part of the mycota of Australia, but to show the way forward. The list of publications (8 pages) given is helpful to all those seeking information and attempting to undertake an account of the larger fungi of other parts of Australia. This book, coupled with the others on Australian fungi recently published, projects Australian mycology to substantial heights never thought of even ten years ago. The author, The Chief State Botanist, Botanic Gardens of Adelaide and State Herbarium, and The Flora and Fauna Handbooks Committee should be congratulated on this very worthwhile addition to our bookshelves.

Roy Watling, Royal Botanic Garden, Edinburgh, Scotland EH3 5LR.

Author Index, Volume Sixty-eight

Abraham, T. K., *see* **Hosagoudar & al.**
Altés, A., *see* **Esqueda-Valle & al.**
Aneja, K. R., *see* **Sigler & al.**
Anon., Guidelines for reviewers of papers submitted for publication in Mycotaxon, **68:** 9-10. 1998.
Anon., Revised instructions to authors, **68:** 1-7. 1998.
Banik, Mark T., *see* **Hudler & al.**
Bärlocher, Felix, *see* **Marvanová and Bärlocher**
Barr, Margaret E. Pyrenomycetes of British Columbia collected by John Macoun, **68:** 395-403. 1998.
Bellemère, André, *see* **Meléndez-Howell & al.**
Benade, E., M. J. Wingfield, and P. S. Van Wyk. Conidium development in *Hyalodendron* and *Allescheriella* anamorphs of*Ophiostoma* and *Ceratocystiopsis,* **68:** 251-263. 1998.
Bernicchia, Annarosa, and Andrea Piga. A new species of *Echinodontium* from Italy, **68:** 483-491. 1998.
Błaszkowski, Janusz, *see* **Madej and Błaszkowski**
Błaszkowski, Janusz, Tadeusz Madej, and Mariusz Tadych. *Entrophospora baltica* sp. nov. and *Glomus fuegianum,* two species in the Glomales from Poland, **68:** 165-184. 1998.
Boidin, Jacques, and Richard P. Korf. Comments on the names Trametaceae, Coriolaceae, and Trametales, **68:** 497-498. 1998.
Câmara, Marcos P. S., *see* **Crous and Câmara**
Castañeda Ruíz, R. F., B. Kendrick, and J. Guarro. Notes on conidial fungi. XVIII. New species of *Pseudomicrodochium* and *Refractohilum* from rainforest litter, **68:** 23-32. 1998.
Castañeda Ruíz, R. F., B. Kendrick, and J. Guarro. Notes on conidial fungi. XVII. *Amphophialis,* anam. gen. nov., **68:** 11-17. 1998.
Checa, J. Annotated list of the pleosporacean fungi and related genera reported from the Iberian Peninsula and Balearic Islands, **68:** 205-249. 1998.
Couté, Alain, *see* **Meléndez-Howell & al.**
Crane, J. L., *see* **Hosagoudar & al.**
Crous, Pedro W., and Marcos P. S. Câmara. Cercosporoid fungi from Brazil. 2, **68:** 299-310. 1998.
Elix, John A., *see* **Kalb and Elix**
Elix, John A., *see* **Louwhoff and Elix**
Esqueda-Valle, M., E. Pérez-Silva, T. Herrera, A. Altés, and G. Moreno. *Tulostoma portoricense* (Tulostomatales, Gasteromycetes) from Mexico, **68:** 499-503. 1998.
Fatto, Raymond M. Notes on four little red Russulas, **68:** 193-204. 1998.
Galán, R., and G. Moreno. *Ruhlandiella berolinensis,* an exotic species in Europe, **68:** 265-271, 1998.
Gómez-Bolea, A., *see* **Muntañola-Cvetković and Gómez-Bolea**
Gómez-Bolea, A., *see* **Muntañola-Cvetković & al.**
Goos, R. D., and V. B. Hosagoudar. *Meliola chennaiana* sp. nov. and some additional records of fungi from India, **68:** 41-46. 1998.
Guarro, J., *see* **Castañeda Ruíz & al.**
Gulis, Vladislav I., and Ludmila Marvanová. *Filosporella exilis* sp. nov. on submerged plant debris from Belarus, **68:** 313-320. 1998.
Heredia Abarca, Gabriela, and Ángel Mercado Sierra. Tropical Hyphomycetes of Mexico. III. Some species from the Calakmul Biosphere Reserve, Campeche, **68:** 137-143. 1998.
Herrera, T., *see* **Esqueda-Valle & al.**
Horak, E., and J. Mouchacca. Annotated check list of New Caledonian Basidiomycota. I. Holobasidiomycetes, **68:** 75-129. 1998.

Hosagoudar, V. B., *see* **Goos and Hosagoudar**

Hosagoudar, V. B., T. K. Abraham, and J. L. Crane. Two new asterinaceous fungi from Karala, India, **68:** 19-22. 1998.

Hoyo, P., *see* **Muntañola-Cvetković & al.**

Hudler, George W., Sandra Jensen-Tracy, and Mark T. Banik. *Rhytisma americanum* sp. nov.: a previously undescribed species of *Rhytisma* on maples (*Acer* spp.), **68:** 405-416. 1998.

Jensen-Tracy, Sandra, *see* **Hudler & al.**

Ju, Yu-Ming, *see* **Rogers and Ju**

Kalb, Klaus, and John A. Elix. The chemistry of some species of *Buellia* sensu lato (Lecanorales, lichenized Ascomycotina), **68:** 465-482. 1998.

Karakaya, A. Powdery mildew on *Conyza* and *Cosmos* in Turkey, **68:** 493-495. 1998.

Kendrick, B., *see* **Castañeda Ruíz & al.**

Korf, Richard P., *see* **Boidin and Korf**

Kumar, R., *see* **Sigler & al.**

Loguercio-Leite, Clarice, and Jorge E. Wright. *Diplomitoporus dilutabilis,* a new species of Polyporaceae (Aphyllophorales) from Santa Catarina Island, Brazil, **68:** 47-51. 1998.

Louwhoff, Simone H. J. J., and John A. Elix. The lichen family Parmeliaceae (Ascomycotina) on Lord Howe Island, Australia, **68:** 429-463. 1998.

Madej, Tadeusz, *see* **Błaszkowski & al.**

Madej, Tadeusz, and Janusz Błaszkowski. *Oidium* sp. (Erysiphaceae) on *Cassia senna,* a fungus new to the mycota of Europe, **68:** 293-295. 1998.

Magnes, M., Ch. Scheuer, and U. Söderholm. A new variety of *Baggea pachyascus* (Patellariaceae, Ascomycota) from Finland, **68:** 321-325. 1998.

Maheshwari, R., *see* **Sigler & al.**

Marvanová, Ludmila, *see* **Gulis and Marvanová**

Marvanová, Ludmila, and Felix Bärlocher. Hyphomycetes from Canadian streams. IV. *Spirosphaera dimorpha* sp. nov., **68:** 33-40. 1998.

Mascarell, Gérard, *see* **Meléndez-Howell & al.**

McKenzie, Eric H. C. Book Reviews, **68:** 517-520. 1998.

Meléndez-Howell, Leda M., Alain Couté, Gérard Mascarell, and André Bellemère. Ultrastructure des asques et des ascospores de *Desmazierella acicola* (Sarcoscyphaceae, Pezizales, Ascomycetes). Intérêt sytématique et biologique, **68:** 53-74. 1998.

Mercado Sierra, Ángel, *see* **Heredia Abarca & Mercado Sierra**

Moreno, G., *see* **Esqueda-Valle & al.**

Moreno, G., *see* **Galán and Moreno**

Mouchacca, J., *see* **Horak and Mouchacca**

Muntañola-Cvetković, M., and A. Gómez-Bolea. *Arborillus llimonae* nov. gen. et sp., a synnematous lichenicolous hyphomycete, **68:** 145-155. 1998.

Muntañola-Cvetković, M., P. Hoyo, and A. Gómez-Bolea. *Periconia fusiformis* anam. sp. nov., **68:** 131-136. 1998.

Núñez, María, *see* **Suhirman and Núñez**

Pérez-Silva, E., *see* **Esqueda-Valle & al.**

Piga, Andrea, *see* **Bernicchia and Piga**

Powell, Martha J., and Will H. Blackwell. Phenetic analysis of genera of the Saprolegniaceae (Oomycetes), **68:** 505-516. 1998.

Rogers, Jack D., and Yu-Ming Ju. The genus *Kretzschmaria,* **68:** 345-393. 1998.

Scheuer, Ch., *see* **Magnes & al.**

Shoemaker, R. A. On *Helminthosporium anomalum,* **68:** 311-312. 1998.

Shukla, R. V., *see* **Sigler & al.**

Sigler, Lynne, K. R. Aneja, R. Kumar, R. Maheshwari, and R. V. Shukla. New records from India and redescription of *Corynascus thermophilus* and its anamorph, *Myceliophthora fergusii,* **68:** 185-192. 1998.

Simmons, Emory G. *Alternaria* themes and variations (224–225), **68:** 417-427. 1998.
Söderholm, U., *see* **Magnes & al.**
Suhirman and María Núñez. Indonesian Aphyllophorales 3. Poroid and stereoid species from Kerinci-Seblat National Park, western Sumatra, **68:** 273-292. 1998.
Suhirman and María Núñez. *Schizopora trametoides* sp. nov. A trimitic dimidiate species from Sumatra, **68:** 157-164. 1998.
Tadych, Mariusz, *see* **Błaszkowski & al.**
Vánky, Kálmán. New Australasian Ustilaginales, **68:** 327-344. 1998.
Van Wyk, P. S., *see* **Benade & al.**
Wingfield, M. J., *see* **Benade & al.**
Wright, Jorge E., *see* **Loguercio-Leite & Wright**

INDEX TO FUNGOUS AND LICHEN TAXA, VOLUME SIXTY-EIGHT

This index includes names of genera, infrageneric taxa, species, and infraspecific taxa, as well as new names of suprageneric taxa. All new names are in CAPITALS. The page number on which a new name is proposed is followed by an asterisk (*). Attention is drawn to two papers not indexed here except for new names and their basionyms: "Annotated list of Pleosporacean fungi ..." on pp. 205-249, and "Indonesian Aphyllophorales 3 ...," on pp. 273-292, which are themselves indices.

Acanthophiobolus
  helicosporus 400
Acarospora
  reagens 154
Achlya 508, 512
Agaricostilbum 41-42
  palmicola 42
  pulcherrimum 41-42
Allescheriella 251-252, 254, 260-261
Alternaria 417-418, 420, 422-423, 426
 Sect. Brevicatenatae 418
  alternata 423, 426
  cuscutacidae 426
  DESTRUENS 417-419*, 420-422, 424, 426
  dianthicola 418
  eryngii 423, 425
  euphorbiicola 423, 425
  gaisen 418, 422, 426
  pseudorostrata 423, 425
  tenuissima 422, 424
Amandinea 474
Amerobotryum
  indicum 42
Amphisphaeria
  multipunctata 397-398
  vibratilis 397
AMPHOPHIALIS 11-12*, 14, 16
  CONCINNA 11, 12*-14
Antennularia
  vancouverensis 397
Anthracoidea 335
Aphanodictyon 508, 513
Aphanomyces 508, 513
Aphanomycopsis 513
Aplanes 508, 512-513
ARBORILLUS 145, 152*, 154
  LLIMONAE 145-146, 148, 150, 152*-153
Arthroderma
  tuberculatum 191
Ascostroma 349
Asterina 19-20
  ciferriana 19-20
  contigua 19-20
  SARACAE 19*-20
  rank? Englerulaster 19-20
Aurophora 65

Baggea 321, 323
  pachyascus 321-322
   var. MACROSPORA 321*, 323, 325
   var. pachyascus 321-322
Battarrea 499
Battarreoides 499
Beltrania
  rhombica 141
Beltraniella
  portoricensis 138
Bipolaris
  sorokiniana 311-312
Bolinia
  tubulina 380
Brevilegnia 508, 512-514
Brevilegniella 508, 512-514
Buellia 465, 469, 474, 476, 478-479
  adaucta 466
  aggrediens 466
  bahiana 473
  bellardii 467
  caloosensis 467
  catasema 467
  chermesina 467
  crocata 467, 469
  curtisii 468
  deightonii 468
  diorista 468
  disciformis 465, 478-479
   var. triphragmia 478
  efflorescens 468
  elizae 468
  epiflavia 476
  epimarta 469
  gerontoides 469
  glaziouana 470
  hypopelidna 470
  japonica 470
  mediospora 476
  melanochlora 471
  melaxanthella 471
  metaleptodes 471
  montana 471
  multispora 472
  natalensis 472
  omalia 476
  pachnidisca 472
  parasema 465, 478-479
   var. minor 478-479
  placodiomorpha 472, 474
  pleiotera 472-473
  rechingeri 473
  rubifaciens 473

[Buellia] sanguinariella 476
        var. ferruginascens 473
    serotina 473
    subpulcella 474
    termitophila 465, 474
    triphragmia 478-479
    turgescens 474
    vaccinii 475
    wheeleri 475
    xylographella 475
    xylophila 465, 475
    zahlbruckneri 475
Bulbothrix 429, 431, 459
    goebelii 431, 433-434, 460
    lordhowensis 431, 434, 459-460
    queenslandensis 460
    queenslandica 431, 434-435
    tabacina 431, 435-436, 460

Calyptralegnia 508, 512-513
Camarops
    tubulina 380
Catillaria 67
    gerontoides 469
    metaleptodes 471
Cephalotrichum 150
Ceratocystiopsis 251-254, 261
    retusi 251-252, 255, 258, 260
Ceratocystis 252, 254
    retusi 254
Cercospora 299
    adenocalymmae 303-304
    carveriana 304, 309
    cordylines 302-303
    lonchocarpi 306
    richardsoniae 304, 306-307, 309
    urostigmatis 300, 302
Cercosporella 302
    antiaridis 302
Cetraria 353
Chaetoplea
    INVERECUNDA 205, 215*
Chalara 252
Cheilymenia 71
Chlamydopus 499
Chorioactis 54, 65, 71
Chrysosporium 185, 188
    asperatum 191
    fergusii 188
    fermentotritici 185, 187-189
    thermophilum 188
Cinereomyces 50
Cladolegnia 512
Cladosporium 253, 260
Clathrospora
    pyrenophoroides 218
Cochliobolus
    sativus 311-312
Comoclathris
    PYRENOPHOROIDES 205, 218*
Cookeina 65
    sulcipes 65
Coprolepa
    gigaspora 397
    saccardoi 397
Coriolus 497-498
Corynascus 188-189
    heterothallicus 188-189
    novoguineensis 189
    sepedonium 189
    thermophilus 185-189
Couchia 508, 512, 514
Cryptodiaporthe
    macounii 397
Ctenomyces
    serratus 191

Daldinia 349, 374
    angolensis 373
    warburgii 381
Desmazierella 54, 65, 67-68, 71-72
    acicola 53-55, 57-58, 60-62, 64-65, 67-68, 70-71
    piceicola 54
Diaporthe
  Sect. Latispora 396
    binoculata 396
    columbiensis 396
    exiguestroma 397
    lokoyae 398
    macounii 397
Diatrype
    bullata 396
    macounii 396
Dictyuchus 508, 513
Diplomitoporus 47, 50
    DILUTABILIS 47, 48*-50
    lindbladii 50
Diploschistes 146, 148, 150
    diacapsis 145, 152-154
Dischloridium
    tenuisporum 137-138
Discosphaera
    deusta 356, 375
Doratomyces 146, 148, 150
    nanus 145-146, 150
    phillipsii 146
Dothiora
    sphaeroides 397

Echinodontium 483-484, 490-491
    ballouii 484, 490
    japonicum 484, 490
    RYVARDENII 483, 484*-485, 487-491
    taxodii 484
    tinctorium 484
    tsugicola 484, 490
Entorrhiza 327, 342-343
    aschersoniana 342-343
    caricicola 342-343
    casparyana 342-343
    CASPARYANELLA 327, 341, 342*-343
    cypericola 342-343

[Entorrhiza] fineraniae 342, 343
    parvula 342-343
    raunkiaeriana 342-343
    scirpicola 342-343
Erysiphe
    polygoni 294

Fibrodontia 158
Filosporella 313-314, 316-317, 320
    annelidica 320
    aquatica 320
    EXILIS 313*-314, 317-320
    fistucella 320
    pinguis 320
    versimorpha 320
Flavoparmelia 429, 431-432, 459
    euplecta 432, 436-437, 460
    haysomii 432, 437-438, 460
    kantvilasii 437
    norfolkensis 437, 459-460

Gassicurtia
    acidobaeomycea 477
    coccifera 477
    coccinea 476
    coccinoides 477
    manguensia 477
    pseudosubpulcella 477
Geniculosporium 346
Geodina 65
Geolegnia 508, 512
Grallomyces
    portoricensis 138-139
Graphium 252
Gyrostomum
    curtisii 468

Hadrotrichum 358
Helminthosphaeria 71
Helminthosporium
    anomalum 311-312
    sativum 312
Hermatomyces
    sphaericum 141
Heteroconium 16
Heterodermia
    leucomelos
        ssp. boryi 442
Holttumia 350
    congregata 350, 359-360, 375
Hyalodendron 251-254, 260-261
    lignicola 260
Hyalorhinocladiella 251-252, 260
Hydatinophagus 513
Hydnobolites
    cerebriformis 265
Hyphodontia 158, 161-162
Hypocopra 397
    amphisphaerioides 397
    gigaspora 397
Hypomyces
    columbiensis 398
    lactifluorum 398
Hypotrachyna 459
    aurulenta 438
Hypoxylina
    verrucosa 381
        f. macrosperma 379
        f. macrostroma 379
Hypoxylon 348-349, 357, 378, 381
    abyssinicum 361-362, 372
    aggregatum 361-362, 372
    angolense 373
    atrosphaericum 373
    cantareirense 378
    cetrarioides 352, 374
    clavus 353, 374
    coenopus 353, 370, 374
        var. apoda 369-371, 374
    cohaerens
        var. microsporum 373
    colensoi 374
    confusum 375
    congestum 375
    cyclopicum 362
    deustum 346, 348-349, 356-357, 365, 375
        f. conidiophorum 381
        f. madagascariensis 368, 381
    eriodendri 358, 375
    fragaria 359-361, 375
    frustulosum 375-376
    gigaspermum 359-360, 376
    heliscus 370-371, 376
    lenormandii 380
    lucidulum 359, 377
    macrospermum 359-360, 377
    magnosporum 356-357, 377
    mauritanicum 377
    micropus 361, 377
    neocaledonicum 363-364, 378
    nicaraguense 375
    novemexicanum 398
    nucele 359-361, 378, 386
    nucigenum 359-360, 378
    pavimentosum 363-365, 378
    perforatum 398
    pseudotubulina
        var. macrosperma 378
        var. macrostroma 379
    sandvicense 366-367, 379
    sphaericum 363-364, 380
    symphyon 378
    tessulatum 366, 380
    tuberiforme 380
    tubulinum 380
    ustulatum 356, 381
    verrucosum 381
        var. macrosperma 379
        f. macrostroma 379
    xylarioides 382

Isaria
    pulcherrima 42
Isoachlya 508, 512

Isthmospora 41-42
  spinosa 41-42
  trichophila 42

Kionachaeta 16
  nanophora 16
  PLEOMORPHA 11-12, 16*
Kretzschmaria 345-347, 349-350, 354-356, 365, 368, 370-371, 374, 379, 381, 385
  aggregata 361, 372
  albocephalum 372-373
  angolensis 373
  apoda 354, 359, 373
  apus 373
  arntzenii 373
  atrosphaerica 373
  australiensis 354, 373
  bengalensis 373
  berkeleyana 371, 373
  botrites 352-353, 374
  brasiliensis 365
  bulgarioides 364-366, 374
  cetrarioides 348-349, 351-353, 362, 374, 376, 378-380, 385
  chardoniana 370, 374
  clavus 345-351, 353-355, 359, 364, 366, 368, 370, 373-375, 378-379, 385
  coenopus 354-355, 370, 374
    var. apoda 369-370, 374
  colensoi 374
  confusa 374
  congesta 375
  CURVIRIMA 345, 348-349, 351, 355*-356, 358-359, 362, 375, 385
  deusta 345-350, 352, 356-358, 363, 366-368, 373, 375, 377, 381, 385-386
  divergens 354, 375
  ERIODENDRI 345, 351, 358*, 365, 375, 385
  erythraeae 361, 375
  frustulosa 375
  gomphoidea 371, 376
    var. microspora 369-370, 376
  guaranitica 376
  GUYANENSIS 345, 351, 358*, 360, 376, 385
  heliscus 370-371, 376
  intracolorata 372, 376
  knysnana 376
  kurziana 376
  lichenoides 352-353, 362, 376
  lucidula 348, 351, 359, 377, 386
  MACROSPERMA 345, 348-351, 359*-361, 375-378, 385-386
  mauritanica 367, 377
  MEGALOSPORA 345, 351, 361*, 377, 385
  microcephala 377
  micropus 347-349, 351, 353, 355-356, 358, 361-362, 371-372, 375, 377, 380, 385
  microspora 369-370, 377
  MILLERI 345, 352, 363*, 365, 367, 378, 386
  NEOCALEDONICA 345, 351, 363*-364, 378, 380, 386
  novoguineensis 353-355, 378
  paradoxa 352-353, 378
  pavimentosa 346-348, 352, 357-358, 364-366, 374, 378, 385-386
  pechuelii 352, 378
  phoenicis 378
  proxima 352-353, 378
  puiggarii 354-355, 379
  pusilla 354-355, 379
  rehmii 379
  rugosa 379
  SANDVICENSIS 347-348, 352, 357, 363, 365-366*, 368, 376-377, 379-380, 385
  scruposa 372, 379
  sessilis 379
  singaporensis 352-353, 379
  sphaerocephala 380
  spinifera 356, 361-362, 380, 385
  stilbophora 380
  tonkiniana 352-353, 380
  truncata 380
  tuckeri 380-381
  turbinata 369-371, 381
  verrucosa 381
  xylarioides 353, 382
  ZELANDICA 345, 351, 367*-368, 382, 385
  zonata 347-348, 352, 357, 368, 381-382, 385-386

Lachnum 71
Lactarius 398
Lambdasporium 33, 36-39
  viridense 37, 39
Laurilia
  sulcata 483, 491
Lecanora
  insperata 477
Lecidea
  aggrediens 466
  catasema 467
  diorista 468
  elizae 468
  epimarta 469
  gerontoides 469
  hypopelidna 470
  insperata 477
  japonica 470
  melanochlora 471
  melaxanthella 471
  metaleptodes 471
  parasema 479
  xylographella 475
Leightoniomyces 146, 148, 150

- [Leightoniomyces] phillipsii 146, 148, 150
- Leiosphaerella
  - falcata 400
  - moravica 398-400
  - praeclara 400
- Lembosia 19
  - TERMINALIAE-CHEBULAE 19, 20*-21
- Lenzites 497
- Leptographium 252
- Leptolegnia 508, 512-513
- Leptolegniella 508, 513-514
- Leptosphaeria 400-401
  - compressa 400
  - gaultheriae 397
  - MACOUNII 395, 399-400*
  - macrospora 401
  - MACROSPOROIDES 395, 399, 401*-402
  - nitschkei 401
- Lophiostoma
  - aequivocum 396

- Massarina
  - microspora 397
- Melogramma
  - columbiensis 397
- Melanomma
  - rhododendri 397
  - sanguinarium 396
- Melasmia 413
  - acerinum 407
- Meliola 43
  - CHENNAIANA 41, 43*-44
  - salaciae 42
  - tenella
    - var. atalantiae 42
  - weberae 41, 43, 45
- Melomastia
  - mastoidea 397
- Metasphaeria
  - macounii 397
  - megalospora 401
- Microsphaera
  - diffusa
    - f. diffusa 294
  - penicillata 294
- Microstoma 65
- Molliardiomyces 68
- Monodictys
  - fluctuata 139
  - lepraria 139
  - paradoxa 141
- Montagnula
  - CAMARAE 205, 225*
- Muciturbo 270
  - reticulatus 267, 270
  - truncatus 270
  - verrucosus 270
- Myceliophthora 188-189, 191
  - hinnulea 189
  - fergusii 185, 188-189
  - lutea 189
  - thermophila 185, 188-189
  - vellerea 191
- Mycoenterolobium
  - platysporum 139
- Mycosphaerella
  - rosaeicola 398
- Myelochroa 429, 459
  - aurulenta 431, 438, 460

- Nanoscypha 65
- Nectria
  - episphaeria 397
  - pithoides 397
  - purtonii 397
- Nemania 349, 377
  - maxima 356, 377
- Neofuscelia 429
  - pulla 431, 439, 460-461
  - verrucella 460
- Nodulosphaeria 401
  - megalospora 401
- Nummularia
  - albocincta 373
  - caespitosa 374
    - var. areolata 374
  - frustulosa 375
  - gigaspora 366-367, 376
  - macrospora 366-367, 377
  - tubulina 380
- Numulariola
  - pyrenocrata 379
  - tubulina 380

- Oidium 293-296
  - cassiae-hirsutae 294
  - cassiae-siameae 294
- Ophiobolus 400
  - anguillides 400
  - castillejae 400
  - crassus 400
  - gracilis 400
- Ophiostoma 251-253, 260-261
  - nigrocarpum 253
  - perfectum 253
  - piceae 253
  - piliferum 251-254, 256, 260
  - pluriannulatum 251-254, 256, 260
- Ovulariopsis 294

- Paraparmelia 429, 431-432, 440, 459
  - asilaris 440
  - HUTTONII 429-430, 432, 439*-440, 442, 459-460
  - murina 432, 440-441, 460
  - scotophylla 460
  - xanthomelanoides 439-440
- Parmelia 429, 431-432, 459
  - amplexula 452
  - antleriformis 453
  - aurulenta 438
  - austrosinensis 444

[Parmelia] cetrata 450
  consociata 454
  conspersa
    var. laxa 456
    f. isidiigera 456
  crinita 444
  cristifera 445
  defecta 446
  erumpens 432, 441, 443, 460-461
  euplecta 436
  exuviata 455
  flavescentireagens 456
  gardneri 447
  goebelii 433
  haysomii 437
  isidiigera 456
  murina 440
  pulla 439
  queenslandensis 432, 443, 460
  queenslandica 435
  reticulata 451
  stramineonitens 430, 457
  tabacina 435
  tasmanica 457
  tenuirima
    f. corallina 441
  thamnoides 458
  tinctoria 448
Parmelina
  aurulenta 438
Parmelinopsis
  spumosa 460
Parmotrema 429, 431-432, 445, 459, 461
  austrocetratum 449
  austrosinense 432, 444, 447, 460
  cetratum 450
  chinense 460
  crinitum 432, 444-445, 460-461
  cristiferum 432, 445-446, 460-461
  defectum 432, 446-447, 459-460
  gardneri 432, 447, 460
  immmiscens 473
  rampoddense 460
  reticulatum 451
  sancti-angelii 460
  tinctorum 432, 448, 460
Passalora 299
  CORDYLINES 300, 302*-303
  UROSTIGMATIS 300*, 302
Penzigia
  arntzenii 373
  catareirensis 378s
  chardoniana 370, 374
  frustulosa 376
  verrucosa 381
Pericaudilum
  lobatum 141
Periconia 131, 136, 146, 148
  atra 131
  atropurpurea 136
  britannica 131
  byssoides 131
  cookei 131
  echinochloae 131
  ellisii 136
  FUSIFORMIS 131-132*, 134, 136
  hispidula 131, 136
  kambakkamensis 136
  lateralis 131, 136
  macrospinosa 131
  madreeya 136
  minutissima 131
  nana 146
  pseudohispidula 136
  warticulata 136
Periconiella
  anisophylleae 137, 140
Phaeoramularia 299
  ADENOCALYMMAE 302-303*
Phaeosphaeria 401
Phellorinia 499
Phialocephala 14
  mexicana 16
Phialocorona 16
  pleomorpha 16
Phillipsia 65
Phyllacia
  neocaledonica 364
Phyllactinia
  dalbergiae 294
Piloporia
  ALBOMARGINATA 273, 288*
  indica 288
Pindara 65
Pithya 65
Plectospira 508, 512-513
Pleospora
  armeriae 402
  camarae 225
  herbarum 401
  inverecunda 216
  pyrenophoroides 218
  tarda 401
  triglochinicola 401
Pleurotus 398
Podosordaria
  truncata 380
Polyporus
  albo-marginatus 288
  cinerascens 50
  lindbladii 47
  lutescens 497
  versicolor 497
Poria
  lenis 47
Poronia
  heliscus 370, 376
  turbinata 371, 382
Protoachlya 508, 512
Protoventuria
  vancouverensis 397
Pseudocercospora 299, 309
  LONCHOCARPI 306*-307
  RICHARDSONIAE 304*, 306, 309
  RICHARDSONIICOLA 307*-309

Pseudomassaria
    sepincolaeformis 398
Pseudomicrodochium 23, 27
    aciculare 27-28
    antillanum 27-28
    candidum 27-28
    cylindricum 27-28
    fusarioides 27-28
    lauri 27-28
    NECTANDRAE 23, 24*-28
    suttonii 27-28
    triseptatum 27-28
Pseudoparmelia
    euplecta 436
Pseudopithyella 65, 71
Pseudoplectania
    nigrella 65
Psora
    saviczii 154
Pyrofomes
    albomarginatus 288
Pythiopsis 508, 512

Ramgea
    annulispora 67
Refractohilum 23, 31
    achromaticum 31
    galligenum 31
    MYCOPHILUM 23-24, 26, 29-30*, 31
    peltigerae 31
Relicina 429, 459
    filsonii 431, 448-449, 460-461
Rhytisma 405-406, 409-410, 412
    acerinum 405-407
    AMERICANUM 405, 412*-413
    punctatum 406-407, 409, 411
Rhizina 71
Rhopalopsis 349
    aggregatum 361, 372
    angolense 373
    berkeleyanum 371, 373
    cetrarioides 352, 374
    clavus 349, 353, 374
    coenopus 353, 374
    confusum 375
    congestum 375
    contracta 375
    kurziana 376
    lichenoides 376
    microcephala 377
    micropus 361, 377
    puiggarii 354, 379
    xylarioides 382
Rhopalostroma 373
    angolense 373
    sphaerocephalum 380
Rimelia 431-432, 459, 461
    austrocetrata 432, 449-450, 460
    cetrata 432, 450-452, 460-461
    reticulata 432, 451-452, 460-461
    STICTICA 429-430, 432, 442, 452*, 459-460
Rinodina
    insperata 477
Rosellinia 351
Ruhlandiella 270
    berolinensis 265, 267, 269-270
    hesperia 270
Russula 193, 201
  Sect. Rigidae 201
  Subsect. Lepidinae 201
  Subsect. Lilaceinae 203
  Subsect. Pusillinae 201
  Subsect. Roseinae 193, 196, 198
    corallina 193, 199-201
    peckii 196, 198
    PSEUDOPECKII 193, 194*-196, 198
    rosea 199
    RUBELLIPES 193, 196*-198
    uncialis 193, 201-203

Saccothecium
    sepincola 398
Saprolegnia 508, 512
Sarcoscypha 53-54, 64-65
    coccinea 65
Sarcosoma 64
Schizopora 157-158, 161-162
    flavipora 161
    radula 161
    TRAMETOIDES 157, 158*-161
Schizostoma 499
Scoliolegnia 508, 512, 514
Scutellinia 71
Selenosporella 16
Skeletocutis 47
    diluta 50
    papyracea 50
Sommerstorfia 508, 513
Sorosporium
    chamaeraphis 327, 330-331
    panici-miliacei 341
Speiropsis
    simplex 137, 140
Sphaeria
    albodeusta 356, 373
    clavus 345, 349, 353, 374
    coenopus 353, 374
    convexa 356, 377
    deusta 350, 356, 375
      var. platyceps 375
    diffusa 377
    inverecunda 215
    mauritanica 377
    maxima 356, 377
    micropus 361-362, 377
    nigerrima 356, 377
    tubulina 380
    versipellis 356, 381
    zonata 368-369, 382
Sphaerosoma
    mucidum 270
Sphaerotheca
    cassiae 293-294, 296

Spiropes
    dorycarpus 41, 45
    guareicola 45
    helleri 45
Spirosphaera 33-35, 37-38
    DIMORPHA 33*-34, 36-40
    minuta 33, 35, 37, 39-40
Sporidesmiella 16
Sporidesmium
    adscendens 140
Sporisorium 331, 335, 337, 339
    ANTHRACOIDEISPORUM 327, 332, 334, 335*-337
    CHAMAERAPHIS 327, 330*-331, 335-336, 341
    inayati 339
    iseilematis 339
    ISEILEMATIS-CILIATI 327, 338-339*, 341
    iseilematis-prostrati 339
    mitchellii 339
    PSEUDORAPHIS 327, 331*-332, 335-336
    thirumalacharii 339
Sporothrix 251-253, 256, 258, 260-261
Sporotrichum 185, 187-188
    thermophile 188
Spragueola
    mucida 270
Squamarina
    lentigera 154
Stemphylium 401
Stilbohypoxylon 349, 362
    rehmii 379
Stilbum 362
Stromatoneurospora
    phoenix 376
Stromatosphaeria
    deusta 356, 375
Stylaspergillus 14

Taenionella
    subsessilis 141
Taeniospora
    descalsii 39
    gracilis 39
        var. enecta 39
Teichospora
    inverecunda 216
Theissenis
    pyrenocrata 379
Thielavia
    heterothallica 188
    thermophila 185, 187
Thindia 65, 71
Thraustotheca 508, 513-514
Thrombium
    epigaeum 146
Torula
    verrucospora 141
Trametes 160, 497-498
    flavescens 50
Trichaptum 161-162
    biformis 161
Trichoglossum 71
Trichosphaeria
    breviseta 397
    pilosa 397
Trichothyrium
    asterophorum 41-42
Tulostoma 499, 501
    albicans 499
    fimbriatum
        var. campestre 499
    exasperatum 500, 502
    nanum 499
    occidentale 499
    opacum 502
    portoricense 499-503
    striatum 499
    xerophilum 499

Unguiculella
    rehmii 67
Ustilago 328
    altilis 328
    confusa 330, 336
    INALTILIS 327, 328*-329, 332
    triodiae 328
Ustulina 345-347, 349-350, 368, 380
    brachyspora 374
    brasiliensis 364, 374
    decipiens 375
    deusta 345-349, 356-357, 375
    linearis 357, 376-377
    macrosperma 359, 377
    maxima 356, 367, 377
    microsperma 377-378
    microspora 377-378
    mori 378
    pavimentosa 364, 378
    placentiformis 378
        var. magnifica 378
    pyrenocrata 379
    tessulata 366, 380
    tuberiformis 380
    tubulina 380
    vulgaris 345-348, 350, 356-357, 368-369, 381
        f. conidiophora 381
        f. madagascariensis 368-369, 381
    zonata 347, 365-366, 368-369, 382

Verticicladiella 252
Verticicladium
    trifidum 67

Xanthoparmelia 429-431, 433, 459, 466
    amplexula 433, 452-453, 460
    antleriformis 433, 453-454, 460
    australasica 460
    colorata 466
    consociata 433, 454, 460
    exuviata 433, 455, 460

[Xanthoparmelia] flavescentireagens 433, 455-456, 460-461
  isidiigera 433, 456-457, 460-461
  scabrosa 453, 455
  tasmanica 430, 433, 457-458, 460-461
  thamnoides 433, 458-460
Xylaria 23-24, 30-31, 345, 348, 370-371, 373, 376-379, 381, 385
  anisopleura 376
  apiculata 392
  APODA 345, 369*-371, 374, 376-377, 381, 386-387
  atrosphaerica 373
  coenopus 353, 374
  contracta 375
  cubensis 31
  feejeensis 371
  frustulosa 376
  guaranitica 376
  HELISCUS 345, 370*-373, 376, 379, 381, 385
  INTRACOLORATA 345, 372*, 376, 386
  kurziana 376
  microcephala 377
  multiplex 370
  polymorpha 376, 379, 381
  puiggarii 354, 375, 379
  rhytidophloea 371
  schreuderiana 379
  tuberiformis 368
Xyloma
  acerinum 406
Xylosphaera
  apiculata 382
  arntzenii 373
  guaranitica 376
  sessilis 379

Zygosporium
  masonii 141
  oscheoides 142

Reviewers, Volume Sixty-eight

The Editors express their appreciation to the following individuals who have, prior to acceptance for publication, reviewed one or more of the papers appearing in this volume.

A. W. Archer
M. R. Barr
G. Bills
U. Braun
F. D. Calonge
L. M. Carris
J. C. Clausz
N. Corlett
P. W. Crous
E. Descals
J. C. Dianese
O. Eriksson
D. J. Galloway
D. A. Glawe
R. Hanlin
G. L.Hennebert
L. Holm
D. J. Galloway
J. Ginns
D. A. Glawe
R. P. Korf
R. E. Koske
K.-H. Larsson
H. T. Lumbsch
D. Malloch
W. F. O. Marasas
W. W. Martin
P. McCarthy
E. H. C. McKenzie
D. Minter
N. P. Money
D. Nicolson
M. E. Palm
D. N. Pegler
M. Rajchenberg
P. Roberts
A. Y. Rossman
R. L. Shaffer
H. Scholz
R. Watling
J. Webster
T. W. K. Young

ERRATA

VOLUME SIXTY-EIGHT

Page 74, line 44 for *Bohemican* read *Bohemian*

Publication Date for Volume Sixty-seven

MYCOTAXON for April-June 1998, volume 67: 1-546
was issued on June 30, 1998

MYCOTAXON is published quarterly during the periods of January–March, April–June, July–September, and October–December by Mycotaxon, Ltd., 316 Richard Pl., Ithaca, NY 14850. Application to mail at periodicals postage rates is pending at Ithaca, NY, and at additional mailing offices. Subscription rates: In U.S. and possessions, one year, $268.00; reduced rate for personal subscribers, one year, $128.00. Foreign subscriptions, one year, $276 by surface mail, $308 by ISAL air mail; reduced rate for personal subscribers, $136 by surface mail, $168 by ISAL air mail.

POSTMASTER: Send address changes to Mycotaxon, Ltd., P.O. Box 264, Ithaca, NY 14851-0264.

MYCOTAXON offers BOOKS of Special Interest

prices include shipment by surface mail

JUST PUBLISHED! **Mycotaxon Cumulative Index for Volumes XLI–LX (1991-1996),** by Karen D. Gettelman, Richard P. Korf, Susan C. Gruff, & Ian F. Korf. Mycotaxon, Ltd. 1998. Softbound, 296 pages, 6x9 inches. $35.00. ISBN 0-930845-07-2.

Author and taxon indexes to volumes 41-60 of *Mycotaxon*. (Indexes 1-20, 21-40 available.)

Fungi of China, by S. C. Teng. Mycotaxon, Ltd. 1996. Hardbound, xiv + 586 pp., 426 illustrations, map, portrait, index, 8-1/2x11 inches. $79.00. ISBN 0-930845-05-6.

Edited by Richard P. Korf, with a foreword by Rosaline Z. Deng. Proceeds from sales go to the Teng family.

What reviewers have to say about Teng's *Fungi of China*

"Although in part a memorial to the major figure in Chinese mycology, this book is much more than that. It makes accessible for the first time much of the information on Chinese fungi previously available only to those mycologists able to read Chinese. The book is important for any researcher interested in the systematic relationships, diversity, and distribution of fungi on a global scale." *New Zealand Journal of Botany* 35: 265-266. 1977.

"An extensive index to all taxa ... makes this book readily accessible to the user. The editor is to be complimented with the result of his work, that enables mycologists and pathologists to learn about the fungi of China. It should be present in every public and private mycological library." *Persoonia* 16: 424. 1997.

"The publication of Teng's work now gives taxonomists easy access to the contributions of this remarkable scientist without having to undertake a fastidious searching in libraries. The careful and critical editing is certainly an added value to this book." *Sydowia* 48: 277-278. 1997.

Biodiversity of Tropical Microfungi, edited by Kevin D. Hyde, University of Hong Kong Press. 1997. Softbound, xiv + 421 pp., illustrated, 6-1/2x9-1/2 inches, $57.50 by surface mail, $64.00 by air mail (shipped from Hong Kong). ISBN 962-209-422-8.

Twenty-one chapters by an international set of widely respected authors, with emphsis placed on Ascomycetes and Deuteromycetes.

A Monograph of the Fungus Genus Cercospora, by Charles Chupp. Published by the author. Ithaca. 1953. Hardbound, 667 pp., 222 illustrations, octavo. $25.00. (No ISBN.)

Despite the passage of the years, this volume, providing descriptions, line drawings, and keys to over 1800 species and synonyms of *Cercospora*, remains an essential reference resource for anyone working on the genus or its many splits. Unsold copies were saved from destruction by Mycotaxon, Ltd. Proceeds from sales go to the Chupp family.

Mail Orders: Mycotaxon, Ltd., P.O. Box 264, Ithaca, NY 14851-0264, U.S.A.
E-mail orders: <rkorf@innet.com>. **Fax orders:** Nov–Apr: (813) 321-1460; May-Oct: (607) 273-4357.
Payment by check drawn on a US bank, money order, or by VISA/MasterCard

EDITORS OF MYCOTAXON

Pavel Lizoň
EDITOR-IN-CHIEF
Plant Pathology Herbarium, Cornell University
401 Plant Pathology Bldg.
Ithaca, NY 14853-4203, U. S. A.

Eric H. C. McKenzie
BOOK REVIEW EDITOR
Landcare Research
Private Bag 92170, Auckland
New Zealand

Karen D. Gettelman
INDEX EDITOR
7044 Amherst Avenue
St. Louis, MO 63130
U. S. A.

Grégoire L. Hennebert
FRENCH LANGUAGE EDITOR
32 Rue de l'Élevage
B-1340 Ottignies - LLN
Belgium

MYCOTAXON is a quarterly peer-reviewed journal devoted to all phases of mycological taxonomy and nomenclature. It is accredited with the International Association for Plant Taxonomy for the purpose of registration of new names of fungi. All articles are reviewed by specialists prior to acceptance. Publication is open to all persons. Papers may be in French or in English. Summaries in those or any additional languages desired by the authors are given for longer articles. Printing is on high quality, acid-free book paper. Authors prepare their own *camera-ready* copy after having received critical comments from pre-submission reviewers. *Instructions to Authors* appeared in Mycotaxon 68: 1-7. 1988, posted on out website at <www.mycotaxon.com/instructions.html>, and *Guidelines for Reviewers* appeared in Mycotaxon 68: 9-10. 1998, posted on our website at <www.mycotaxon.com/reviewers.html>.

SUBSCRIPTION INFORMATION

Current volumes contain at least 512 pages. All subscriptions are on an annual basis, with four quarterly volumes each year. Personal subscriptions are available at a substantially reduced rate for individuals who agree not to deposit their copies in another library than their personal one within 3 years of receipt. Do not address any orders to the Editors, but instead to the Mycotaxon Order Department, P.O. Box 264, Ithaca, NY 14851-0264 USA, or your agent. Prices and availability of back volumes will be sent upon request to that Department, but are also posted online at <www.mycotaxon.com>, or can be provided in an E-mail version on request to <rkorf@innet.com>. Mycotaxon may also be obtained on a journal-exchange basis. Proposals for such exchanges from journals, institutions, or individuals with difficulty in obtaining foreign currency should be addressed to the Order Department.

The current annual subscription prices (four volumes) are:

	USA	Foreign (surface mail)	Foreign (ISAL airmail)
REGULAR (multi-user)	$268	$276	$308
PERSONAL (individual)	$128	$136	$168

(Most back volumes—except vols. 1, 39, 43, and 46—are still available at $35 each by surface mail, $55 each by air mail; all are available in photocopy and 34-ff. in microfilm.)

CUMULATIVE INDICES

Printed versions of the *Mycotaxon Cumulative Indices* for Volumes 1-20 (ISBN 0-930845-00-5), Volumes 21-40 (ISBN 0-930845-01-03), and Volumes 41-60 [ISBN 0-930845-07-02] are available (see descriptions at <www.mycotaxon.com/books.html> and order there or through your local bookstore's listings under "Books in Print"). An online *Cumulative Index to Taxa in Volumes 61-ff.* and the *Cumulative Author Index to Volumes 61-ff.* are posted at <www.mycotaxon.com>.

AVAILABILITY IN MICROFILM, TEAR SHEET & PHOTOCOPY

MYCOTAXON is also available in *microfilm* from UMI Company, 300 N. Zeeb Road, Ann Arbor, MI 48103-1500, U.S.A., through their Microfilm Catalog <www.umi.com/sim>. Photocopies are also available from them as an article or whole issue reprint through their InfoStore Catalog <www.umi.com/infostore>. Tear sheets or photocopies of individual articles may be obtained through *The Genuine Article*™, I.S.I., 3501 Market Street, Philadelphia, PA 19104, U.S.A., or through their website <www.isinet.com>.

CONTACTING MYCOTAXON'S EDITOR-IN-CHIEF BY E-MAIL OR FAX

To reach the Editor-in-Chief regarding manuscripts, you may E-Mail to <PL18@cornell.edu> or you may FAX to Pavel Lizoň at (607) 255-4471.

CONTACTING MYCOTAXON'S ORDER DEPARTMENT BY E-MAIL OR FAX

To reach the Order Department for information or placing orders, you may E-Mail to <rkorf@innet.com> or you may FAX to Orders, Mycotaxon, Ltd., May–October at (607) 273-4357, and November–April at (727) 321-1460.

VISIT MYCOTAXON ON THE WORLD WIDEWEB AT **<www.mycotaxon.com>**